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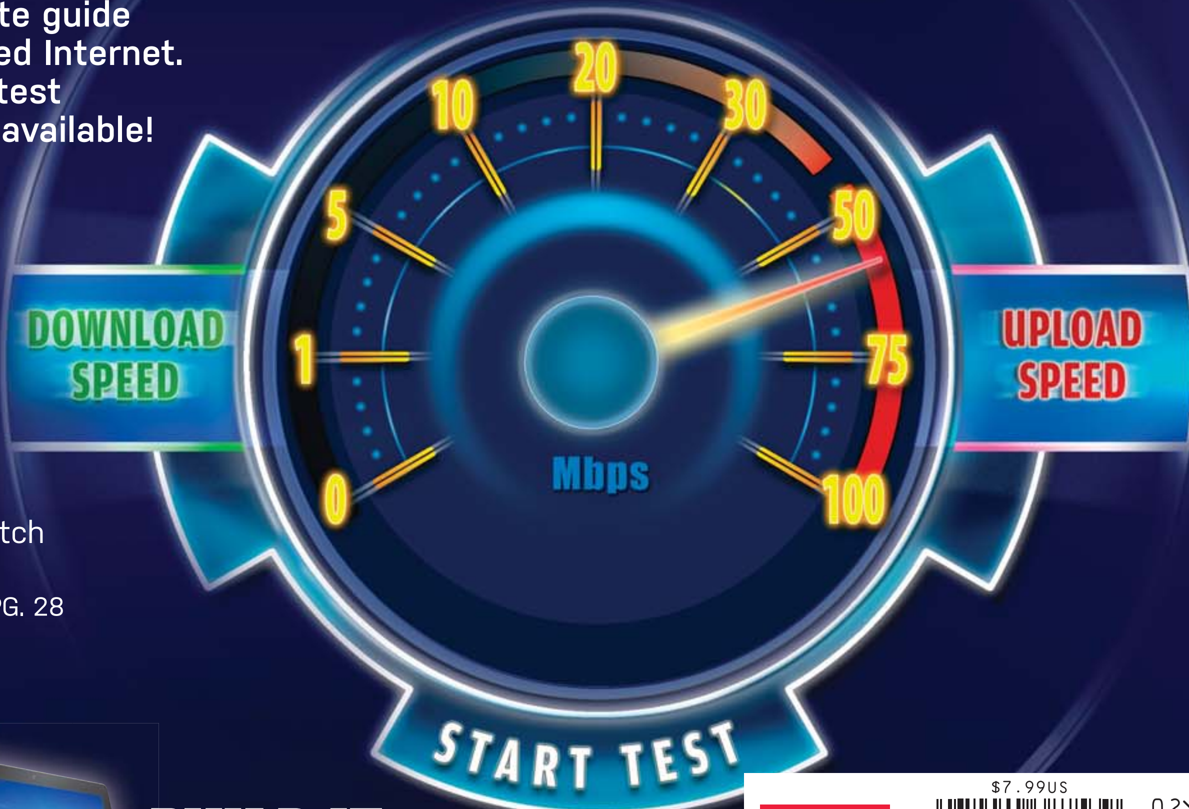
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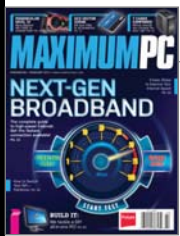
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Illustration by
Georg Zumbulev

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MAXIMUM PC

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Gordon Mah Ung

TAKE THE SOCKET PLEDGE WITH ME

THE MAINSTREAM tech media declared the PC dead—yet again—and enthusiasts had a full-on freak-out when rumors surfaced that Intel intended to dump socketed processors within two years. The details of the story are on page 8, but let it be known far and wide, Intel *will* support socketed processors for the "foreseeable future." AMD, likewise, had already taken the pledge, saying it would be offering socketed CPUs, too.

To the casual observer, this may seem like a tempest in a land grid array. It's not, of course—it's really about our freedom to build the systems we want with as much price and performance granularity as we can get. Quite simply: We like our ability to choose what we want rather than having it dictated to us. Want to run a $60 motherboard with a $330 CPU? Go ahead. Planning to start your $350 board with a $100 CPU and eventually move up to a $330 part? That's your decision to make on the PC today.

That won't be the case if the PC transitions to motherboards with fixed processors, as was rumored. Instead, motherboard companies would greatly pare down their inventories and offer just a handful of boards with integrated CPUs rather than dozens of CPU and motherboard choices. Let's not even mention that if you ever had a problem with the motherboard, you'd have to toss the CPU with it. And who eats that cost? The mobo maker or the CPU maker?

Such a world would indeed signify that PC end times were nigh, so you can see why the nerd rage was flying.

So, what may really be happening? My guess: Intel is signaling an armistice in the performance arms race between the two x86 powers, as both companies concentrate on the real threat right now: tablets and mobile devices.

Rather than the end of interchangeable CPUs, it's more likely an end to the brutal "tick-tock" strategy for desktops and laptops. Instead, the upgrade cycles could be stretched out from two years to three. Hardly the end of socketed CPUs.

Hell, for all I know, Intel may need to move to a new type of cartridge design à la the Pentium II's SEC, so it can embed DRAM into the core or use some technique to increase memory bandwidth for the onboard GPU. I'll also point out that soldered chips have been in use by AMD and Intel on desktops already—in extremely small form factor boxes.

We really don't know what will happen in three to four years and, frankly, Intel probably doesn't either. I do know that any path Intel and AMD take for the PC must include end-user upgradability of the CPU or both will suffer the wrath of their strongest supporters.



Gordon Mah Ung is Maximum PC's deputy editor, senior hardware expert, and all-around muckraker.

↘ submit your questions to: comments@maximumpc.com

THE NEWS

The End is Nigh for Sockets! (Not)

Internet fuels rumors that user-upgradable CPUs will be dead beyond 2014

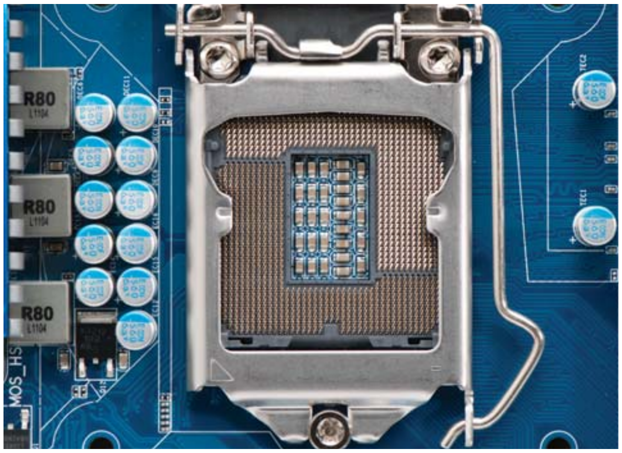
THE RUMOR started in Japan but crossed the world in nanoseconds: The upcoming Haswell CPUs would be the very last of the company's socketable processors and all future chips would be soldered to the motherboard, according to a report and leaked road map on Asian tech website PC Watch.

Within hours, the information was repeated and reinterpreted by numerous other tech websites. Some opined that the move by Intel would effectively finally kill the PC.

Of course, none of it turned out to be true. In a rare move to quash the rumors that had spread like wildfire, the chip giant broke its traditional radio-silence approach and refuted the reports.

"Intel remains committed to the growing desktop enthusiast and channel markets, and will continue to offer socketed parts in the LGA package for the foreseeable future for our customers and the enthusiast DIY market," Intel spokesman Daniel Snyder told *Maximum PC*. "However, Intel cannot comment on specific long-term product roadmap plans at this time, but will disclose more details later per our normal communication process."

The problem Intel faces, however, is that once the conspiracy stories start, they're difficult to kill without absolute proof staring the naysayers in the face. Even with Intel disavowing the rumor, many still questioned the exact meaning of "foreseeable future." And what does "enthusiast" mean? Doesn't that imply that Intel could still weld lower-end CPUs to boards and herd all enthusiasts into the big boy LGA2011-type sockets in 2014?



Intel showed uncharacteristic openness in denying reports that it's jettisoning sockets.

Intel, already loath to talk about unreleased products, let alone unreleased products beyond the next unreleased products, wouldn't spill any more details beyond that.

Piling on, AMD officials decided to tweak the chip giant's nipple by releasing a statement that it stood firm by sockets: "We have no plans at this time to move to BGA-only packaging and look forward to continuing to support this critical segment of the market. But for the desktop market, and the enthusiasts with whom AMD has built its brand, we understand what matters to them and how we can continue to bring better value and a better experience," a spokesman said. Of course, we must note, AMD's own statement also only extends to 2014 and no further.

One question also clearly hanging out there is what the advantage would be of moving the bulk of PCs from today's LGA or PGA sockets to BGA, which must be soldered in place. BGAs are generally used when very thin or small machines are needed. Both AMD and Intel currently offer BGA desktop's for very compact PCs.

Kelt Reeves, owner of boutique PC maker Falcon Northwest, said that even if Intel moved to soldered parts, it's possible it won't be as horrible as people are predicting because few mainstream users ever upgrade their CPUs.

"Where it does get really questionable for me is in the supply chain," Reeves said. "If you overclock your soldered-down K-SKU CPU and burn it out, did you kill the CPU or motherboard? And will your motherboard maker have to handle lots of RMAs from overclockers that aren't really the result of the [motherboard maker's] part failing? And the motherboard makers now not only have to stock a $200 motherboard as a piece of inventory, they have to stock a $500 CPU-and-motherboard combo. That's an extreme inventory cost hike, and may lead to less motherboard models being made and less stock being kept on hand.

"There's a lot of ramifications to it that we don't have enough confirmed info to really evaluate properly yet, but I don't think a soldered CPU would actually be quite as disruptive to the end user as to the companies in the supply chain." **–Gordon Mah Ung**

Valve Steambox Is in the Works

Hot on the heels of the debut of Steam's Big Picture Mode is word that the Washington-based game developer is preparing a living room PC of its own to compete with next-gen consoles. Though hardware and OS details are absent at this time, it's possible the company's anti–Windows 8 stance and recent push into the world of Linux could be tied to its living room aspirations.

Valve could be quickly competitive in the living room, too, given its massive gaming library, millions of subscribers, and the fact that the hardware and software needed for such a box already exist. It would also mean the demise of the dreaded game disc, and possibly let PC gamers start a game on their desktop and then resume playing on the couch, if they were so inclined. The big unknown here is whether it'll be an open or closed system, and of course, when it will be in our living rooms. **–JN**



Google Rules Out Windows 8 Apps

Currently, there are no Google apps for either Windows 8 or Windows Phone 8. But it is surely just a matter of time before that changes, right? Wrong! Google Apps product management director Clay Bavor recently told UK technology site V3 that the search giant has no plans for building Windows 8 and Windows Phone 8 apps at the moment.

He didn't stop there, though. He candidly added, "We are very careful about where we invest and will go where the users are, but they are not on Windows Phone or Windows 8."

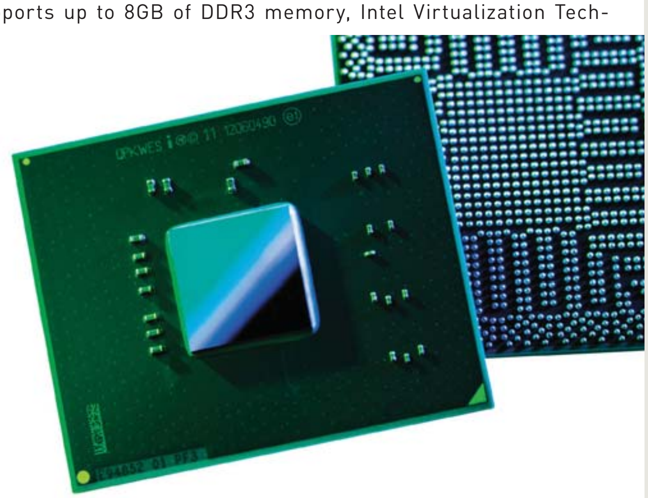
"If that changes, we would invest there, of course," he added. **–PC**

Atom Enters Server Space

Intel's Atom family gained notoriety as the architecture of choice for netbooks and nettops, but the future holds more. There are, of course, the mobile handset and tablet categories, and now, you can add servers to Atom's resume. The new Atom-based S1200 is the world's first low-power, 64-bit server-class system-on-chip for high-density microservers.

The S1200 is a dual-core part with Hyper-Threading support. It has a memory controller that supports up to 8GB of DDR3 memory, Intel Virtualization Technologies (Intel VT), eight PCI Express 2.0 lanes, ECC support, and various other I/O interfaces integrated from Intel chipsets.

Intel's kicking things off with three processors ranging from 1.6GHz to 2.0GHz. They're available today starting at $54 (in 1,000-unit trays). **–PL**





Tom Halfhill **Fast Forward**

POST-PC ERA WON'T STIFLE PCS

SUPPOSEDLY, the wild popularity of smartphones, tablets, e-readers, smart TVs, and hand-held videogames has brought us the "post-PC era." To hear some folks talk, PCs are not only in decline, but are almost as doomed as dinosaurs. For proof, they point to slipping PC sales and to troubled PC vendors like Hewlett-Packard.

Maximum PC's editors have objected to this verdict, and so do I. Furthermore, I disagree with the pessimists who fear that weaker demand for PCs will stifle the development of new PC processors and platform innovations. If you are a PC enthusiast—and you wouldn't be reading this magazine if you weren't—happy days are still ahead.

True, 10 years ago, I predicted that desktop PCs were destined to become tomorrow's mainframes. By that I meant PCs would no longer be the most popular computing platform and would be regarded largely as business machines for tasks requiring more processing power than smaller devices can deliver. I didn't say PCs would become extinct. After all, mainframes are still very important, although we often call them by different names ("enterprise servers," "cloud computers," "data-center systems," "supercomputers," etc).

It's also true that PC sales aren't climbing as they once did. But people are still buying more than 300 million PCs a year, and several developing countries still represent a healthy growth market. Frankly, sales would be better if Microsoft hadn't buried Windows 8 under a baffling user interface. As for HP, its troubles run much deeper than lackluster PC sales.

The fact is that economics still favor big investments in PC processors. In 2012, people bought 750 million smartphones and tablets, but those processors accounted for only $6.2 billion in sales. Half as many PC processors reaped $31 billion. So although mobile devices are sexy, PC chips earn the big bucks.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.



Thomas McDonald
Game Theory

THE GHOST OF GAMES PAST

FOR THE second time in as many months The Ghost of Games Past has visited my PC to remind me of classic games... and how much better they are now.

This time, the ghostly visitor in the night is Baldur's Gate, the game that put BioWare on the map and brought the classic D&D experience from the Gold Box age into a whole new epoch of awesome. Unfortunately, they couldn't repeat the magic that turned X-Com (one of the best PC games ever, and now almost wholly unplayable for anyone but nostalgia-sadists) into the brilliant XCOM.

In fairness to the makers of Baldur's Gate: Enhanced Edition, they didn't have the deep pockets and vast resources of 2K/Firaxis. Beamdog/Overhaul just doesn't bring that much stick to the table. Rather than getting a reinvented Baldur's Gate, or even a heavily upgraded one, we get something significantly less impressive.

I say that with the understanding that "significantly less impressive" is relative. Baldur's Gate is still one of the best RPGs ever. It's also still on my shelf, and available online for about $10. Nothing in the Enhanced Edition diminishes the original game, but it doesn't enhance it that much, either.

This is Baldur's Gate with Baldur's Gate II improvements, a graphics bump, a better journal, and a tedious arena mode. They say they fixed or added 400 things to this version, but pathfinding is not among them. Also, it's buggy and crashy as all get-out. You can save your money, load up the original game, install the Tutu mod and a few others, and get a fine BG experience.

The bigger problem is that Baldur's Gate is an old-school game that just hasn't aged all that well, and remains little more than a nostalgia act. The fussy combat and bland narrative is something for a younger, more tolerant era of computer gaming. The most bizarre part is that you can trace a straight line from the concepts of BG right through all of BioWare's products. Dragon Age and Mass Effect *are* Baldur's Gate, done better. Why would we want it done worse?

You can follow Thomas McDonald on Twitter: @StateOfPlayBlog.

CCleaner Hits 1 Billion Downloads

Old-school vets remember when CCleaner was called Crap Cleaner. Piriform launched the freemium utility almost a decade ago, and we still like to use it after all these years to clean up unwanted files and cache that tends to accumulate. So do many others, apparently, as the software has now been downloaded more than a billion times, according to Piriform. Remarkably, CCleaner has been installed on one quarter of the world's PCs and now spans 200 countries and more than 45 languages. In addition to the free version, CCleaner is also available in paid forms, running $25 for the Professional Edition and $35 for the Business Edition. **–PL**

AMD to Enter SSD Market

You can say at least one thing about AMD enthusiasts—they are certainly loyal. So much so that AMD recently started offering its own branded DRAM modules, and now the rumor mill suggests that the company will next offer AMD-branded SSDs. After all, AMD is already a well-known name in the high-performance arena, and already qualifies RAM for its GPUs, so it's got a leg up over other random competitors, for sure. Perhaps AMD is counting on its customers to be so loyal that they want nothing but AMD-branded components inside their rigs, and if so, this is good news indeed for the company.**–JN**

State of the Union: Windows 8

Now that Windows 8 is out in the wild, many of our readers are curious to see if it's been the failure they predicted. Bad news, folks—it hasn't failed, but it's also too early to qualify the nascent OS as a "failure" or a "success." Microsoft is already claiming it's moved 40 million Windows 8 licenses, but the lion's share of those were purchased by PC manufacturers, and the machines they are attached to may still be sitting on store shelves.

More interesting is a story from the all-knowing Paul Thurrott, who claims that sales of Windows 8 failed to live up to Microsoft's own internal projections, though we have no idea what those projections were. For its part, Microsoft is trying to stay ahead of the wave of blame, saying the fault lies with PC manufacturers who delivered lackluster products. The manufacturers naturally don't want to be left holding the touch-enabled bag on this one, and are already pointing the finger back at Microsoft. Asus CFO David Chang has famously described demand for Windows 8 in the first month as, "not that good right now." Another problem is that the Windows 7 launch was lauded as a rescue from the much-maligned Windows Vista operating system, whereas now people are mostly happy with Windows 7, and thus see no reason to change operating systems. Microsoft also faces stiff competition from Apple's OSX, and the ever-growing tablet market, as well. Still, this is an OS with very long legs, so Microsoft has plenty of time to turn things around. **–JN**





Quinn Norton
Byte Rights

LOOKING DEEP WITHIN

OVER THE YEARS, there's been talk on and off about a technology called Deep Packet Inspection, but apart from sounding like the title of sysadmin-themed porn, why should you care?

Technically, DPI is what happens when an ISP looks past the headers, or metadata, of the packets that carry information all around the Internet and into the content. On its own, looking doesn't hamper the Internet, but only that packet header is required by the machines that need to pump the cats through the series of tubes.

Like all technologies, DPI isn't inherently good or bad, but potentially either. Good uses include cleaning up spam and viruses, and useful traffic shaping. Bad uses include dystopian control of digital expression and perfect totalitarian surveillance.

But let's break that down a bit. Because DPI looks into each packet, it can be used, as in the case of the NSA warrantless wiretaps, to copy every packet. In the case of Comcast, it was used to identify BitTorrent traffic and disrupt it. In America, it's been used to very specifically target advertising. In other countries known to use DPI, like China and Bahrain, it could be (and likely is) used for specifically targeting political activists.

DPI is the technology that allows violation of net neutrality, lets ISPs throttle competing services, and rights-holders to comb the net looking for content. But despite the dark side, given how easy and useful for companies it is, it's inevitable. Without rigorous legal protection, you'll never know if it's used on you.

The only thing that slows down DPI at all is encryption, coded messages ISPs can look at but never make sense of. Fortunately, encryption tools are becoming available to everyone. DPI is the future of the net—and so is you encrypting your way back to free speech and privacy.

Quinn Norton writes about copyright for Wired News and other publications.

Nvidia Auto-Optimizes Games



If you've ever stared slack-jawed at a videogame's laundry list of video options and not known the difference between HBAO, SSAO, AF, and AA, or WTF, relax—you're not alone. A lot of gamers don't know how to fine-tune their games in accordance with their hardware, and games themselves are also horrible at detecting hardware and setting the options accordingly. Nvidia is hoping to end this scourge upon gamerkind with its latest software, dubbed GeForce Experience. It's a free desktop client that not only helps keep your drivers up to date, but also lets gamers "optimize" certain titles with just the click of a button.

The software runs off a database Nvidia has developed via "expert testers" who have determined what settings to use on all the latest games when using Nvidia hardware. The software recognizes your hardware, and then prompts you to either apply its suggestions with one click, or ignore them if you want. The software only features about 30 titles at this time. Find out more at www.geforce.com. **–JN**

Leaked Chart Details Desktop Haswell CPUs

Tech rumor site VR-Zone.com claims to have an authentic list of Intel's first wave of "Haswell" desktop processors, and while we can't confirm it outright, the parts listed seem highly plausible. Of the 14 CPUs detailed, six fall under the category "standard power," with TDP of 84W, and eight are referred to as "low power," with TDP ranging between 65W and 35W.

Perhaps the most interesting tidbit of information here is the omission of Core i3. All of the chips on the list fall under the Core i5 and Core i7 family, and range from 3.0GHz to 3.9GHz when you factor in the Turbo Boost. Dual-core parts also appear to be on the way out. Only one of the 14 CPUs isn't quad-core, and Hyper-Threading continues to be a Core i7 exclusive. VR-Zone claims all of the parts listed here are slated for a Q2 2013 release. **–JK**

XtremKey USB 3.0 Is Nearly Indestructible

Come hell or high water, or even a 10-ton truck, LaCie's new XtremKey USB 3.0 flash drive has little to worry about. As the name implies, this flash drive is extremely tolerant of harsh conditions, such as being submerged in water down to 200 meters (over 656 feet). It has a protective cap made of thick ZAMAC metal alloy and wear-resistant screw threads with a rubber O-ring.

When you're not abusing LaCie's XtremKey, it will read data at up to 230MB/s via USB 3.0 and keep your documents secure with AES 256-bit encryption. It's available now in 32GB capacity for $85 and backed by a 3-year warranty. A 64GB model is coming soon, though no word on price. **–PL**



THE LIST

7 UNSUNG HEROES OF THE PC UNIVERSE

7 12CM CASE FAN

These vigilant guardians have not only kept our PCs cool for a generation, but have done so silently.



6 RIGHT-ANGLE SATA CABLE



Before these clever variants existed, SATA cables would bend when the side cover on our case was attached, causing them to pop out of their ports.

5 ZIP TIES

We used to just close our PC side door and hide our cabling shame. With zip ties' help, we can proudly display our rig's tidy guts to the world.



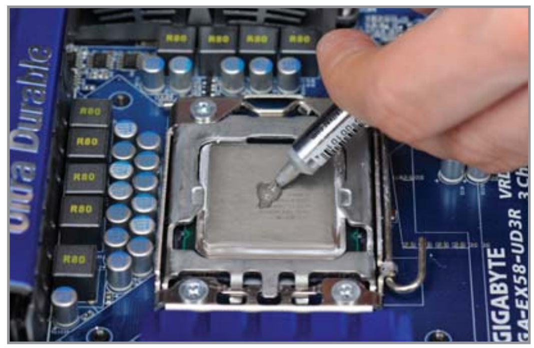


4 MOTHERBOARD LABELS

Remember the horror of trying to figure out where to plug things in on a mobo? We still have PTSD from the USB connectors.

3 THERMAL PASTE

The parts above and below it get all the glory, but it's the sandwich meat that makes it all possible.



2 CASES WITH CABLE ROUTING HOLES

Poor Dream Machine 2000; it had to suffer the indignity of a world without cable-routing holes.



1 POWER SUPPLY

It does its job without fuss or noise, and when it's working perfectly you're not even aware of its existence.



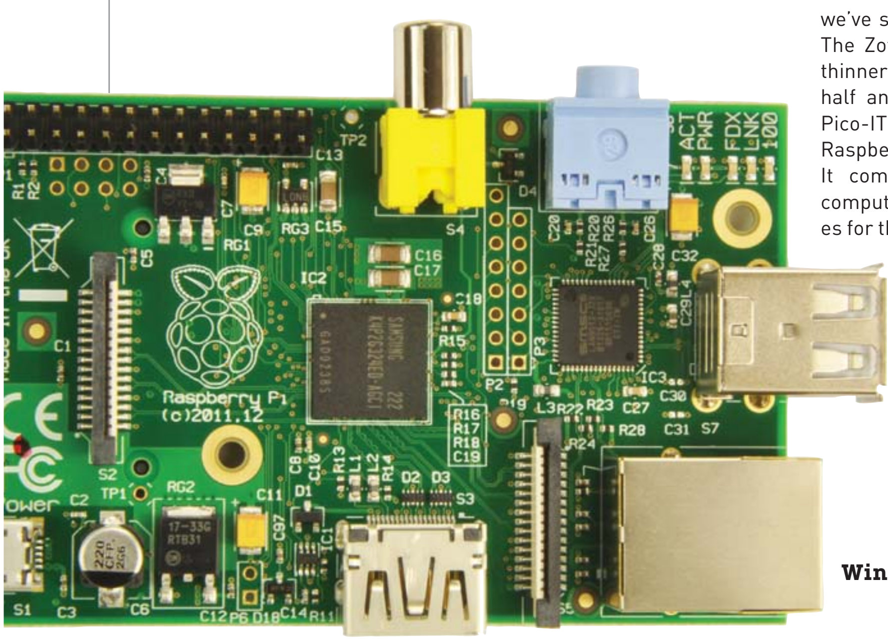
HEAD TO HEAD

BY GORDON MAH UNG

Raspberry Pi vs. Intel NUC

The unique $35 Raspberry Pi computer set the PC world on its ear last year. Part computer science project and part incredibly cheap PC, the DIY single-board computer is such a hot item, some retailers are charging double what the unit originally cost. Of course, where there's money, there's Intel. The chip giant has formally introduced its $320 "Next Unit of Computing," or NUC, PC concept—basically a bare-bones, hobbyist kit PC. While this is admittedly an apple–to-orange comparison in many respects, we felt that hobbyists deserve to see an accounting of the pros and cons of each in a head-on fight.

Other single-board computers have been available, so the Raspberry Pi's real breakthrough is its $35 price, making it exceedingly accessible for experimentation.



Round 1: Size

Intel's NUC is built around an amazingly small 4x4x2-inch chassis that Intel is hoping to make the standard for subminiature-but-powerful PCs. The NUC isn't the first we've seen this small, though. The Zotac Nano XS is slightly thinner than the NUC, by about half an inch, and VIA has its Pico-ITX boards. Of course, the Raspberry Pi has them all beat. It comes as a single-board computer at just over 2x3 inches for the whole package.

Winner: Raspberry Pi

Round 2: Pricing

Intel's Ivy Bridge chips have been amazingly lean on power consumption for the high-performance x86 chips they are. The NUC ships with a 65-watt power brick, and the dual-core Hyper-Threaded Core i3 is rated at 17 watts. Pretty impressive for an x86. However, when you consider that the Raspberry Pi can run off your cell phone charger (provided it puts out 700mA), Ivy Bridge and even the next-gen Haswell are unlikely to ever compete with the Pi in the power-consumption game.

Winner: Raspberry Pi

HEAD



Intel's Next Unit of Computing (NUC) is meant to spur interesting and unique uses for Intel hardware.

Round 3: Applications

We don't mean applications as in specific apps, but the possible uses for these wee PCs. The NUC can be used as an HTPC, a mini Big Picture Steam Box, or slung behind a monitor to create an almost-all-in-one. The Raspberry Pi, on the other hand, is the perfect hobbyist machine for students and tinkerers young and old. It's being used to run everything from MAME cabinets to controlling quad-copter drones. As a device intended to introduce folks on super-tight budgets to computing concepts and programming, the Raspberry Pi is a win no matter how you cut it. However, Intel's NUC is also quite superb at what it's meant for. With its included VESA-mount adapter, it can be used in signage applications and is basically an incredibly powerful small machine.

Winner: Tie

Round 4: Specsmanship

At $35, the Raspberry Pi is pretty low-powered. As a desktop UI, for example, it's not exactly something you want to push regularly, with its 700MHz Broadcom ARM 11 CPU, 256MB of RAM, HDMI, and LAN and USB support. The NUC, on the other hand, is like everything Intel does: a tour de force of specs and hardware. The NUC we have here packs a 1.8GHz dual-core, Hyper-Threaded Core i3 chip and has Mini PCI Express slots to run an mSATA SSD and wireless card. With its HD4000 graphics, the box is capable of reasonable gaming with older titles, too. Hell, our version even packs that new-fangled ultra-fast Thunderbolt port. This round is an easy win for the NUC.

Winner: NUC

Round 5: Performance

Again, there's no debating this. The NUC's size isn't really exciting, but its performance is. Most mini PCs have been based on VIA's CPUs, which aren't exactly speed kings, or AMD's Brazos chips, which don't light any fires themselves. The NUC is really fast for its class. The Raspberry Pi, while incredibly cool for $35, isn't something we'd be happy pushing all day. Yes, it can run a desktop OS, and yes, it can stream some media, but would you really want it to? The answer is no.

Winner: NUC

And the Winner Is…

The fact is, **both** are winners. OK, now quit your bitching; we honestly wouldn't feel right if we called this for one or the other. We think the Intel NUC is a freaking-cool little box and we can imagine it at the heart of several projects around the house and car. At the same time, the Raspberry Pi has so much charm and the price is so damned good (that's the Raspberry Pi's real breakthrough, you know) that there's no reason not to buy one or two of these bare-bones kits to experiment with. So maybe those of you who thought these two devices couldn't be compared were right.

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

> Post-Upgrade Blues
> Drive Order
> Upgrading an XPS 700

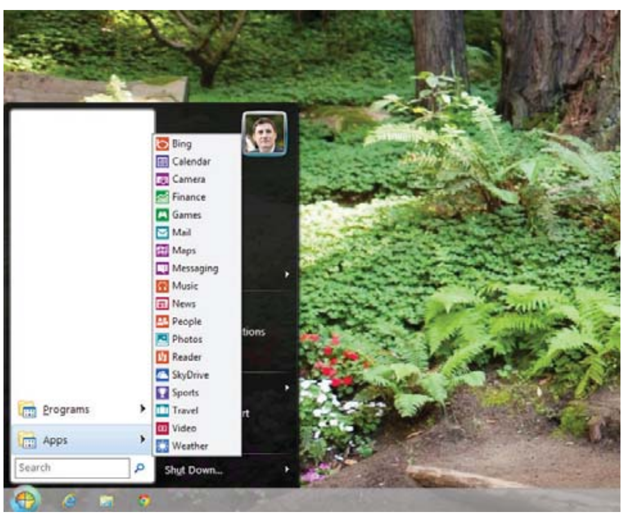
Post-Upgrade Blues

I upgraded to Windows 8 on my laptop. Can you tell me how to reinstall Windows 7? I tried restoring the system from Windows 8 but did not have any luck. Is there a way to use my recovery discs or will I need to purchase a copy of Windows 7?

—Michael De Matteis

THE DOCTOR RESPONDS: If the recovery discs are the ones that came with your laptop, you should be able to use them to reinstall Windows 7 (provided that's what your laptop shipped with). Your product key should still be on the sticker on the bottom of your laptop. If not, you can download the Window 7 ISO that corresponds with your license (bit.ly/X1cTKH) and use that to burn a new install disc. If that doesn't work, due to OEM licensing constraints, contact your laptop manufacturer; they may be able to get you (or sell you) a new recovery disc. Some laptops also have a recovery partition that you can boot into to reinstall Windows—when you boot, keep an eye out for any options to press keys to access a recovery feature.

If you want to downgrade because of program incompatibilities, go ahead and downgrade. But if you just miss the Start menu and hate the Modern UI, there's a way to keep the performance improvements of Windows 8 and get the classic Start menu back. Several ways, actually, but we like Start8 ($5, www.stardock.com) or Classic Shell (free, classicshell.sourceforge.net). Install either one and you can add a Start button back to your taskbar, and even disable the Modern UI entirely. And later, when Modern gets more useful or you feel like experimenting, you can get Modern back without having to downgrade now and upgrade again later.



Classic Shell restores the Start button and menu, and even gives you a choice whether to completely eliminate the Start screen or not, so you can ease into Win8.

SSD Program Sorting

I recently upgraded my old computer with (among other things) an SSD. I don't want to fill it up with unnecessary stuff. I have installed Windows 7 and MS Office on it, but have directed downloads, documents, pictures, videos, etc., to default to a secondary hard drive. I'm wondering about programs. If they aren't frequently used, or maybe just a trial program, is it OK, performance-wise, to put a program on the HDD rather than on the SSD? Would this have any effect on the overall system performance?

—Jack Orkin

THE DOCTOR RESPONDS: In the future, we will all have enough SSD space to install every program we want, but right now, few of us can afford an SSD that big, so some programs invariably have to be installed on mechanical drives. This is perfectly fine. Putting your OS and your most frequently used programs on the SSD is the best way to take advantage of your SSD's access speeds, but there's absolutely nothing wrong with installing less frequently used or trial programs on the HDD. Your instinct is right on the money. They won't load as fast, of course, but who cares? If you wind up using them all the time, make room on the SSD. Otherwise, they're fine where they are.

Put the Jumper Down

A long time ago, there was an article in your magazine dealing with optimal communication/connection arrangements for hard drives and CD-ROMs via EIDE primary masters/slaves and EIDE secondary master/slaves.

I am building a new rig that has SATA components: two SATA HDDs and two DVD drives. They are plugged into the mobo SATA ports: 0 and 1 for the hard drives, 2 and 3 are empty, and ports 4 and 5

↘ submit your questions to: doctor@maximumpc.com

go to the DVD drives. Is there a better way to connect these components to reduce communication bottlenecks?

—Sunnie

THE DOCTOR RESPONDS: The good news, Sunnie, is that the days of having to manually jumper your hard drives and optical drives are long over (although the Doctor will note that cable select worked pretty well at the end).

SATA is point-to-point and does not feature a master and slave relationship like Parallel ATA had, so don't worry about that aspect. The only thing to really be mindful of when hooking up multiple SATA devices is which controller they go to. Modern boards usually have multiple SATA controller chips. Some go to the board's south bridge/peripheral controller hub, and others go to discrete controllers put on the board as a value add. Generally, the chipset controller is preferred over discrete components. One other thing to consider is whether the port is SATA 6Gb/s. On AMD chipsets, all of the SATA ports are SATA 6Gb/s. On Intel, only two of the six from the chipset proper are SATA 6Gb/s. If you eventually buy an SSD that runs at SATA 6Gb/s you will get the best performance running it on a SATA 6Gb/s port. Since your hard drives and optical drives don't benefit from this (very much anyway), the Doctor recommends cracking open your motherboard manual and finding out which of the ports are SATA 6Gb/s. Plug your other drives into the SATA 3Gb/s ports and leave the 6Gb/s ports open for the day when you install an SSD.

Mobo Five for XPS 700

I have a Dell XPS 700 that I purchased in December 2006. I purchased it with a 4-year warranty. During that time, the motherboard had to be replaced four times. I ended up buying a new Dell after the warranty period expired and the fifth motherboard failed.

I would like to use the XPS 700 as my spare computer, but for that I need a new motherboard. I called Dell to see about a motherboard. They said they could order one for me, but they want $440 for it. I don't want to buy another motherboard from them knowing it'll fail after a year. I don't know enough about motherboards to buy one that's compatible with my computer but more reliable, and I don't know if $440 is too much.

Is there a replacement board for this machine I can swap out without being too much of a geek, or should I just bag it?

—Clair Bolton

THE DOCTOR RESPONDS: $440 is an awful lot to pay to replace a 6-year-old motherboard model. It's even a lot to pay for a brand-new top-of-the-line motherboard. They don't make motherboards using the nForce chipset anymore, or even in that form factor (BTX) anymore.

For that amount of money you could nearly replace the entire XPS 700 with a faster computer—we've come a long way in six years. It's possible to get a modern ATX motherboard to work in that great-looking XPS 700 chassis, but it's rather more work than you'd probably like to do (Google "Dell XPS 700 ATX conversion" to see what we mean). You'd still be stuck with an outdated system unless you replaced the CPU, RAM, and videocard, as well. In which case, as we mentioned, you'd probably just be better off with a new computer—unless you really love that XPS 700 case and own a Dremel that you don't mind using.

DDR with No Bloody 2 or 3

I have an old desktop that was given to me a few years ago. It features an Athlon 64 X2 4800+ in a Socket 939 ASRock 939 board with 2GB of DDR, two hard drives, a GeForce 8800 GTS, and 300W PSU. It was running an early build of Windows 7, and one day it would power on but not get through POST. I finally got it running earlier this year after essentially unseating every part in the case and reinstalling it. The last part I reinstalled was the RAM, which seemed to do the trick.

I used the rig this entire year until my IDE DVD drive started to act up, and when I powered off my system and replaced it with another IDE drive it wouldn't get to POST or the screen where it shows the BIOS checking your RAM and HDDs. After a bit of work, I was able to get my graphics card to display an image, but it only shows the motherboard checking the RAM then freezing.

I personally think that my DIMMs may have gone bad, but after switching the configurations from 2GB (4x 512MB), to 1GB, and then to just one stick, I am beginning to believe it may be something else. I would just get more RAM, but seeing that I'm limited to using DDR (not DDR2, just plain DDR RAM), finding replacement parts has been hard. I cannot afford to build a new rig, which I would rather do than dealing with this crap. What should I do, and what exactly is my problem?

—Wayne Strickland

THE DOCTOR RESPONDS: The Doc knows that it sounds like a broken record, but the two most common failure points in an elderly system (other than HDD) are RAM and power supply. Since you don't have a spare bucket of parts, you should first try to diagnose with what you have. First, to ensure that your hard drive isn't going bad and hanging during POST, disconnect both hard drives' cables from the motherboard. It's unlikely to be the issue, but disconnect them just to be sure.

You have pulled RAM, but how do you know the last stick of RAM in the machine isn't the one that's bad? Swap the last stick of RAM with one of the other sticks and try them in different slots. Remember: Power down your system completely and switch off or unplug your PSU for at least 10 seconds before removing RAM or PCIe devices.

If that doesn't work, try resetting the BIOS. If that doesn't work, manually set the RAM timing in the BIOS to the timings supported by the RAM. With the box running, make sure the fan on the CPU is running and not blocked by cat hair, dust, or a mouse house.

If you're still stuck, the next step will probably take additional parts to troubleshoot. Frankly, the Doctor believes the problem may lie with your PSU. The GeForce 8800 GTS came in numerous configurations, with some consuming more power than others. All of them are probably just a wee bit over-the-top for a 300-watt PSU, especially if it's a no-name PSU. And even if it has worked fine for many years, a PSU running at 95 percent of peak through long, hot summers is likely to have a shorter lifespan than one running at 50 percent its whole life. So, the PSU should be one of your first suspects to replace if you can swing it. Usually when power supplies give up the ghost, they just stop working, but that's not always the case. It's possible the PSU has enough juice to POST and get to the RAM check before it gets overloaded and shuts down.

NEXT-GEN BROADBAND

HOW IS HIGH-SPEED INTERNET KEEPING PACE WITH OUR INSATIABLE APPETITE FOR CONTENT? By Marco Chiappetta

Broadband has evolved considerably over the last decade or so in the United States. Whereas just a few years ago, large parts of the country were relegated to pokey 56K dial-up connections over standard phone lines, now multi-megabit broadband connections are commonplace and speed increases are being introduced regularly. In fact, in some test markets, broadband at gigabit speeds is on the way. And yes, that's gigabits with a "G," as in roughly 17,800x more bandwidth than 56K dial-up.

We also have many more choices today. Connecting to the Internet used to mean firing up AOL for millions of users. Now, though, most consumers can choose between multiple service providers, which offer cable, DSL, or even wireless broadband connections with plenty of bandwidth for all but the most demanding users. Broadband may not be universally available here in the states just yet, but availability is far better than it was, and it's consistently improving.

Despite myriad advances made to the county's broadband infrastructure, the story is not all good. According to a few recent studies, the United States still trails some other nations in multiple broadband-related categories, including average connection speed and penetration. For example, South Korea's average connection speed is more than double that of the United States—16.7Mbps vs. 6.1Mbps—and the United States ranks 36th in overall connectivity.

There's more to broadband than just bandwidth and penetration, however, and we hope to fill you in on the details here. Our goal is to help you to better understand the various technologies available now and outline some of the advances coming in the future. We've also got some practical tips for changing ISPs and optimizing your current broadband connection on tap, as well.


DOWNLOAD SPEED
UPLOAD SPEED
0
1
5
10
20
30
50
75
100
Mbps
START TEST

PICK YOUR PLATFORM

Get connected over copper, fiber, wireless, or satellite

There are a number of different ways consumers in the United States have access to high-speed broadband Internet connections. Some, like DSL, leverage existing telephone network infrastructures, while others, like satellite or LTE wireless, use relatively new technologies. Although broadband isn't accessible to everyone in the country, there are multiple options available for most consumers and the choices that are available continue to mature and evolve.

The most common broadband connection types in the United States include digital subscriber line (or DSL), cable, fiber optic–to-home solutions, wireless, and to a lesser extent satellite. Wireline solutions like cable and fiber-to-home will typically offer the highest-bandwidth, lowest-latency connections, and DSL is usually the most affordable, but all of the connection types mentioned here have multi-megabit plans available from numerous Internet service providers (ISPs) in many parts of the country. Before we dig in, also note that all of the broadband connection technologies we discuss here are sometimes referred to as "last mile" or "network edge" connections. What that means is that they're the connection types used by Internet service providers to make the link between end users and the core backbones of the Internet.



DSL modems like the D-Link DSL-520B connect through standard copper phone lines to provide broadband Internet access.

xDSL

According to the most recent data available on the National Broadband Map, DSL is the second most accessible broadband technology in the United States, behind only the various wireless technologies. In the locations where high-speed broadband is available, one form of DSL or another is offered to 88.9 percent of those customers.

Although "DSL" is a term thrown around freely, it actually encompasses an entire family of technologies, which includes asymmetric digital subscriber line (ADSL), symmetric digital subscriber line (SDSL), integrated services digital network (ISDN), rate-adaptive digital subscriber line (RADSL), and high bit-rate digital subscriber line (HDSL), among a few others. DSL leverages the copper cabling used throughout the telephone network to transmit digital data, and as such, the bandwidth offered by the various technologies will vary based on a few factors, like the quality of the physical connection and distance from the exchange, sometimes called the "central office."

DSL is typically more affordable than other solutions because it's cheaper to implement over the existing telephone network, versus deploying new, high-bandwidth fiber cables over the same expanse. Though sometimes cheaper, many DSL solutions can still offer significant bandwidth to end users. Sonic.net, for example, is one of the best-regarded DSL providers in the nation, with plans that offer download speeds of up to 20Mbps. It's able to offer DSL speeds so far above the national average of about 4Mbps by using VDSL2 bonding technology that essentially links dual copper pairs into single connections. Other DSL provid-

THE NEED FOR SPEED

What is super-high-speed Internet good for, anyway?

In many circumstances, the benefits of an ultra-fast broadband connection may not be immediately apparent. There are other factors besides peak bandwidth that ultimately affect a user's experience online and if you're not using the bandwidth you already have available, upgrading to a faster plan isn't going to make much difference. However, as our needs for more bandwidth increase, the benefits of some of the more advanced broadband technologies become clear.

As we start saving more data in the cloud, streaming more HD content, and increasing the number of connected devices in our homes, our bandwidth needs grow. Just a few years ago, having one or two PCs connected in a home was typical. Today, though, it's not uncommon to find a dozen or more connected devices, when you account for smart appliances and televisions, mobile devices, game consoles, desktop systems, and laptops.

How much bandwidth you'll require will obviously vary based on the usage habits of those in your household, but we can give you some rough guidelines and expectations. For example, let's say you've got three users in your home. One is playing a game online, while the other two are streaming HD movies



Game consoles like the Xbox 360, smart TVs and appliances, Internet radios, and all of the other connected devices in your home, consume bandwidth.

ers also leverage bonding technology to increase the effective amount of available bandwidth to end users, but the fastest ISPs are typically concentrated in the more densely populated areas of the country, like California and the Northeast.

A typical DSL setup in a home consists of little more than a filter (or filters) that are used to separate voice and data signals between telephones and a DSL modem. The technology hasn't changed much in recent years, so massive speed increases haven't been offered by many DSL providers, but the technology is mature and reliable, and should suit the needs of mainstream consumers. In the future, however, large bandwidth gains are still possible with DSL. Alcatel-Lucent, for example, announced that through a technology advanced by Bell Labs, it has achieved 300Mbps over two DSL lines (through bonding) at a distance of 400 meters. The technology works by leverage bonding, something called Phantom mode, and vectoring. Phantom mode creates a third, virtual pair on top of the existing two pairs used in the DSL lines. And then vectoring technology filters out interference and crosstalk among them all. The bandwidth of the two physical and the virtual pairs are then combined into a single, ultra-high-bandwidth pipe.



The Data Over Cable Service Interface Specification, or DOCSIS, is used by many cable television operators to provide broadband Internet access over their existing network using a cable modem, like the Motorola SB6120 pictured here.

CABLE INTERNET

On some level, cable Internet access is similar to DSL. However, instead of using the telephone network, cable Internet leverages the cable television infrastructure to provide a broadband Internet connection. Also like DSL, cable Internet is relatively pervasive and is the next most common wireline broadband connection technology in the United States. In areas where broadband is available, cable Internet access is an option for 85.2 percent of consumers.

Many of the technologies employed by cable Internet access providers are determined by the Data Over Cable Service Interface Specification, or DOCSIS. DOCSIS was initially developed by CableLabs, a not-for-profit research and development consortium founded by a number of cable television providers, along with a host of additional contributors, including the likes of Broadcom, Cisco, Conexant, Intel, Motorola, Netgear, Texas Instruments, and a handful of other companies.

Cable Internet is also one of the more mature broadband technologies offered in the United States and bandwidth available to end users is relatively high. If we disregard some fledgling fiber-to-home solutions, cable Internet is among the fastest in the nation. It is not uncommon for cable service providers to offer premium plans in the 50Mbps to 100Mbps (download) range, at prices below $100 month. It is also common to see cable Internet included in "triple play"–type packages that bundle Internet, television, and phone services on a single bill.

Although fast and relatively affordable, one of the disadvantages of cable Internet is that bandwidth is shared not only on the provider's core network, but among smaller nodes, or groups of residents, as well, which can lead to slowdowns during peak usage times. If there aren't numerous users concurrently consuming large amounts of bandwidth, the slowdowns may be imperceptible, but on more congested networks the slowdowns can be significant.

Though already fairly mature, bandwidth gains are still likely as providers improve their networks and implement more features of the DOCSIS 3.0 specification. For example, DOCSIS 3.0 allows for bonding of multiple upstream and downsteam channels to increase total available bandwidth. The specification calls for hardware to support a minimum of four upstream/downstream channels, which can each offer a maximum of 42.88Mbps, but there is no maximum number of channels defined. An eight-channel bonded configuration could theoretically offer a connection speed of up to 343Mbps.

or television from a service like Netflix. For their highest-quality streams, Netflix recommends a 5Mbps connection; a typical stream can consume about 2.3GB an hour. The gamer will use a minimal amount of bandwidth, but the two users streaming video will likely saturate a 10Mbps connection.

The speed differences between mainstream and high-end broadband plans are not trivial and neither is the cost. Actual differences will vary from provider to provider, but we'll use Verizon FiOS as an example. A basic plan that offers 15Mbps down and 5Mbps up will run about $70 a month. Its flagship plan offers 300Mbps down and 65Mbps up, 20x and 13x increases in bandwidth, respectively, for $209 a month. If you can use that kind of bandwidth, the cost per megabit is much better with the high-end plan. To give an example of how those bandwidth ratings affect download speed, the 15Mbps plan can download a 5GB file in about 44 minutes. The 300Mbps plan can do it in 2.2 minutes.

BANDWIDTH CAPS

In an attempt to curb massive bandwidth consumption, some providers—especially wireless providers—have implemented bandwidth caps that kick in when consumption ticks past a certain level. For wireless providers, that number is usually in the 2GB–4GB-per-month range, while wireline providers like Comcast are in the 300GB-per-month range.

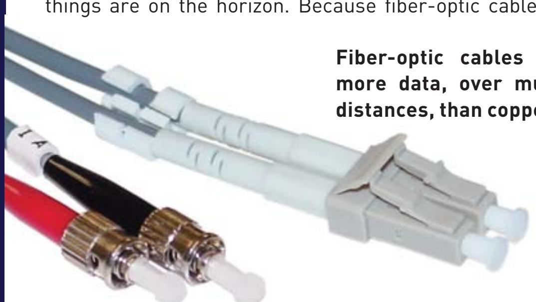
Some would argue that these caps are simply a tool to gouge consumers, while others claim it's a means to ease network congestion. Sonic.net CEO Dane Jasper said this when asked about bandwidth caps, "I don't see caps as being related to network capacity concerns. To put it simply, the heaviest users, when capped, will still use their service during peak/prime time, and network capacity must be built to accommodate the peak load. The sustained use that the heavy users would make is spread around the clock, and doesn't have any substantial impact on capacity planning." Whatever the case, if bandwidth caps become the norm, consumers could be in for significant cost increases in the future as our bandwidth needs increase.

FIBER

Some of the more recent, ultra-high-speed broadband services being offered to US consumers consist of newer fiber-to-the-home deployments. Although fiber-to-the-home, or FTTH, is the most common term end users are likely to hear, there are numerous types of fiber deployments currently in flight across the country. Fiber-to-the-neighborhood (FTTN), fiber-to-the-building (FTTB), fiber-to-the-premises (FTTP), and fiber-to-the-desk (FTTD) are all terms you may hear bandied about. They're all fairly self-explanatory; the significance of each deployment type is the peak performance that can be achieved by each architecture.

To put it simply, the closer the optical fiber cable is brought to end users, the faster the broadband connection can be. Whereas DSL providers typically offer 10Mbps–20Mbps and cable providers up to 100Mbps or so, fiber-to-home providers can offer hundreds of megabits or even full gigabit connections. Verizon's FiOS service, for example, offers a 300Mbps plan in some parts of the country. Google Fiber, which is currently being built out in Kansas City, will offer speeds up to 1Gbps, and Sonic.net offers fiber services in parts of California where users can choose up to 1Gbps services, as well.

Prices for these exotic broadband services vary significantly from more than $200 a month for FiOS's 300Mbps plan, to only $69 a month for Sonic.net's offering. These services, however, are available to only a small fraction of Americans at this time, so competition among the various providers is essentially nonexistent. When asked about current fiber-to-home offerings, Sonic.net CEO Dane Jasper said, "None of these competitive efforts have any substantial national market share at this time, and I don't believe they have much influence on the incumbents except in very small regional pockets." He also said, "Telcos will push fiber closer to the home (or, in the case of Verizon, all of the way)," however, which means some very good things are on the horizon. Because fiber-optic cables offer much more bandwidth than copper wire, over longer distances, it is the most future-proof of the broadband technologies we mention here. Rest assured, it will continually be brought closer and closer to end users, and more bandwidth will be available as a result.



Fiber-optic cables can carry more data, over much longer distances, than copper wire.

Unfortunately, as of the most recent data available on the National Broadband Map, direct fiber Internet services are only available to 17.8 percent of potential broadband subscribers in the United States. For fiber Internet service to have a more meaningful impact on the broadband market, it's going to have to reach a much larger audience. That should happen in time, though.

WIRELESS BROADBAND

Wireless broadband encompasses a handful of technologies, including Wi-Fi, WiMax, and the various cellular networks, among a few others. By far, the most pervasive of these technologies as a service is the cellular network, which thanks to recent LTE build-outs, can offer relatively high peak bandwidth under certain conditions, at affordable rates.

We're all familiar with Wi-Fi, which is designed to cover relatively small areas and not really sold as a service, except for temporary hot-spot applications. WiMAX (Worldwide Interoperability for Microwave Access) is a longer-range technology designed to deliver last-mile wireless broadband access to end users at multi-megabit speeds, as an alternative to wireline technologies like DSL or cable. WiMAX is available from providers in about 80 US markets, and a large number of additional markets around the world, but it isn't very popular as a residential solution. The 3G and 4G cellular networks, however, account for a huge portion of Internet traffic, mostly due to the popularity of smartphones and other mobile devices. 4G LTE networks in particular have been rapidly expanding in recent years and offer relatively high bandwidth. In real-world situations, in markets like New York, San Francisco, and Austin, Texas, 4G LTE broadband can offer upwards of 35Mbps down and 15Mbps up, with much higher theoretical numbers possible.

Taken as a whole, broadband wireless Internet access is the most widely available connection type in the country. According to the National Broadband Map, wireless internet is an option for 98.7 percent of consumers living in areas where broadband connections are available.

As useful as wireless Internet can be, it has some major drawbacks. For one, it is relatively expensive. Wireless data plans typically fall in the $20–$100-a-month range and offer limited amounts of data usage. For example, Verizon Wireless offers a 4GB-per-month shared data plan for $30 and a 12GB plan for $70. Exceed those

HIGH-SPEED FOR THE MASSES

Where is it?

As we've mentioned, broadband isn't universally available across the entire United States just yet. According to a recent study by Akamai Technologies, 81 percent of the country has access to broadband with speeds greater than 2Mbps. That may not sound too bad, but with availability in only 81 percent of the nation, the United States ranks 36th among the countries included in the study. The global average is only 66 percent, which means the United States is decidedly ahead of the curve, but in countries like Germany, the Netherlands, and even Bulgaria, broadband connectivity is in the 94–96 percent range. As compared to the previous year, the United States increased its average by 8.6 percent, which puts the country among the fastest growers, but there is obviously still much work to be done if we're going to catch the leaders.

If you ask those in the know why the United States trails many other nations in broadband availability and speed, you'll likely hear three possible reasons: burdensome government regulations, high corporate tax rates, and the relative high cost of bandwidth in the country. Solving these problems is going to take significant action on the part of the government and some initiative and cooperation from the private sector, but it appears we are on the path to success, especially as younger, more tech-savvy legislators are elected. The FCC's Broadband.gov website has details on the Broadband Action Agenda and lists more than 60 initiatives the FCC intends to undertake over the next few years to implement the recommendations in the National Broadband Plan, which was introduced in March 2010. One of the goals of the National Broadband Plan is to provide 100 million American households with access to 100Mbps broadband connections by 2020.

limits, and you'll have to pay additional fees and/or contend with data throttling. Wireless Internet is also more susceptible to interference than other connection types, and network performance varies wildly depending on a number of factors, including distance from the tower and network congestion. As such, wireless services are best suited to mobile devices, as a backup to wireline solutions, or for casual users that aren't likely to hit the imposed data limits.

What comes after 4G LTE is still up in the air. A 5G standard has yet to be finalized and the 4G build-out is still far from complete. We can reasonably expect lower latency and more bandwidth at longer ranges, but we won't know for sure until a spec is finalized.

SATELLITE INTERNET

Satellite Internet is more of a last resort than a viable solution for most consumers in need of broadband. The technology is a godsend for people who live in rural or remote areas where wireline broadband solutions are not available, but residential satellite broadband speeds simply can't match those of xDSL or cable and costs are usually higher, too.

Typical satellite Internet speeds hover in the 1Mbps to 2Mbps (download) range, through some of the latest technology from providers like HughesNet offer up to 15Mbps down and 2Mbps up. There are monthly bandwidth caps in the 20GB–40GB-per-month range, however, and costs for even the more entry-level plans are somewhat higher than more common wired solutions.

Advancements in satellite Internet will come as compression and bandwidth-sharing technologies are improved, but the most significant gains can only come as newer, more advanced satellite, with higher total capacities, are put into orbit.

BROADBAND OF THE FUTURE

To get a read on broadband's future in the United States, we talked to a couple folks well versed on the subject: Patrick Moorhead, founder and principal analyst at Moor Insight and Strategy, and Dane Jasper, CEO of Sonic.net. When asked about which of the broadband technologies available in the United States will be the most pervasive moving forward, Moorhead said, "Wireless broadband will be the most pervasive in the future, given that it touches so many people in so many places. Wi-Fi wireless in particular will be expanded significantly as service providers attempt to string networks together to take some of the traffic off of congested 3G, 4G, and LTE networks." He continued, "Cable is the winner in terms of the price-to-speed equation, in that most of the investment is a sunk cost. Fiber, as in Google Fiber, is the fastest, but also the costliest to install. Satellite will continue to play a niche role, serving hard-to-reach and rural areas. Its asymmetry and line-of-site requirements outweigh any kind of downlink speed advantage." Dane Jasper mostly agreed, stating, "Domestically, you will see a continued slow march of the incumbent duopoly; cable will gradually upgrade to higher DOCSIS versions as they become available and feasible, and will split nodes in the meanwhile to avoid congestion—at least to the point of avoiding customer churn. Meanwhile, telcos will push fiber closer to the home—or, in the case of Verizon, all of the way—while rolling out faster xDSL technologies: ADSL2+ and VDSL2 today, with bonding and then vectoring." Jasper added, "Wireless is also a factor to consider. With LTE's very-high-speed capabilities, and consumers' interest in tablets and other portable devices, these services are a potential alternative to wireline products."

We also asked what they thought pervasive, ultra-high-speed broadband could mean for consumers, and Moorhead proclaimed, "New usage models will emerge with the advent of fast, reliable broadband. With faster broadband, most of our computing can be done in the cloud, meaning more consistent, reliable, and less expensive experiences. Low-priced displays able to run any app will be all over the house, so literally, every room will enable access to every app and piece of content, anytime." Sounds good to us, though we don't want to downplay the need for fast local storage, as well.

As for why the United States tends to lag behind many other developed nations and what we could do to improve the situation, Dane Jasper put most of the blame on misguided government policies and regulation. He said, "Reversing the course selection of a multi-modal competitive model, which the Republican FCC charted for us in the early 2000s, is the quickest way to resolve the domestic broadband issue. Europe and Asia followed our regulatory course from the 1996 Telecom Act, and stuck with it—while in the United States we faltered, fostering instead a duopoly. While incumbent cable and telcos *have* made substantial upgrades—DOCSIS 3.0, FiOS, U-verse—we continue to over-pay for under-delivery of speed, generally with consumption caps." Patrick Moorhead's view was somewhat different. Moorhead said, "Countries leapfrog each other as it relates to broadband. The United States was viewed as the mobile laggard during the EDGE days, but now has one of the top spots in LTE. Countries like Korea and Japan will continue to dominate with speeds, unless the US government would subsidize fiber rollout. Given the US budget challenges, I don't see that happening, meaning the United States does not gain leadership footing in broadband."

TIPS FOR SWITCHING ISPS

It's easier than you think

Switching ISPs is a major concern for some users, but it need not be. Unless you're locked into a contract with a wretched provider or are married to an email address provided by your ISP, switching to a new provider should be painless. We suppose some users may also be forced to use a particular ISP due to specific work-at-home requirements implemented by their employer, but even then a call to the company's IT-support department should yield results.

If you're locked into a contract, perhaps due to a triple-play-type bundle that links phone, TV, and Internet service, there are still things you can do to switch. Although most ISPs don't make specific uptime guarantees, there is still an implied level of reliability that needs to be met. If service is subpar, start by logging every outage or problem and contacting your ISP's support team. Run regular speed tests too, and log every result that falls below your expected performance level. At some point after reporting continued issues, it won't be cost effective to provide support any longer. Call your ISP, ask for a service manager to hear your case, and you'll eventually be let out of your contract.

Should your ISP-linked email address be associated with numerous logins online, start by setting up a new account with a free service like Gmail and systematically change all of your login credentials. Also, give yourself some lead time and set up an auto-forward to send emails coming into your ISP-linked account to the new account. And check in with your ISP; many will allow access to the email account via webmail, even after you've moved on to another provider.

When or if you do make the switch, assuming you've got a router in your home network, connecting the new modem to your router is usually all that is necessary. Worst-case scenario, you've got to reconfigure your wireless settings in a new router, and maybe a few IP addresses and forwarding rules, but that's about it.

THREE STEPS TO A BETTER BROADBAND CONNECTION

Even your existing broadband service can be made faster with a few simple tweaks

SIGNING UP FOR a fast broadband connection is an obvious first step to ensuring high speeds while surfing the web. Even with a speedy connection in place though, there are a number of things that can be done to ensure optimal performance and reliability. The routers thrown in when you sign up for service aren't always of the best quality, and many service providers also have wimpy DNS (Domain Name Service) servers, which are easily bogged down under load and introduce tons of latency. These things can be easily averted, however, and performance and reliability can be increased with just a few tweaks and a bit of reconfiguration.

1 USE A QUALITY ROUTER The routers bundled with many broadband service plans tend be low-end, dumbed-down products that provide sub-par wireless coverage and are ill-equipped for numerous connections. If you've invested in a fast broadband connection, spend a few extra bucks on a high-quality router, as well. A good router will be outfitted with a faster processor, more RAM, and a better network switch. It will likely offer better wireless coverage, too, and provide faster, more reliable service, even if there are multiple devices attached, all sucking down gobs of data.



The Asus RT-N66U is a powerful wireless broadband router, with an integrated gigabit switch, that will outperform most of the routers bundled with residential broadband service.

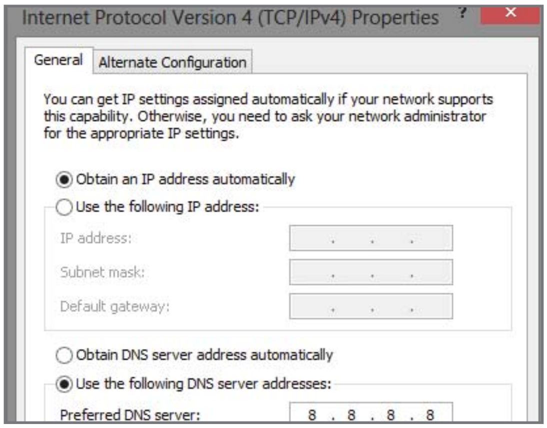
2 POSITION YOUR MODEM AND ROUTER PROPERLY For the best possible connection, your broadband modem should be located as close to the incoming feed as possible. For example, if you've got a cable modem, and the cable line coming into your home has been split numerous times before the modem is attached, the signal quality to the modem will be degraded. For the best performance, the cleanest signal should be fed to your modem, which means connecting it to the main line, as close to the initial split as possible.

Router positioning is also important if you have devices that connect wirelessly. If your router has omnidirectional antennas (and odds are that if you haven't replaced the stock antennas, it does), it is best to position the router as close to the center of the area you'd like covered as possible.



The omnidirectional antennas included with most routers transmit (and receive) signals in all directions. For the best performance, that signal should be centrally located between devices.

3 SWITCH DNS SERVERS Every time you type a URL into your web browser, a request is sent to a DNS server to obtain the corresponding website's IP address. If that server is bogged down or just plain sluggish, it can be slow to resolve addresses and introduce unwanted latency. Try running the DNS Bench utility available at www.grc.com to ascertain the fastest DNS servers in your area, and use those in lieu of your ISP's. You can designate which DNS servers to use in your TCP/IPv4 properties in Windows on each machine, or enter them into the requisite fields in the WAN section of your broadband router's setup utility.



Using the fastest DNS servers available in your area can significantly speed up web browsing.

THE GREAT 2013 CASE

SEVEN CASES MEET ON THE STARTING LINE, BUT WHICH ENCLOSURES MAKE IT TO THE END OF OUR MEGA-ROUNDUP WITH A MEDAL AROUND THEIR FRONT PANELS? By David Murphy



RACE

IF YOU THOUGHT that the only innovation in modern chassis design was the (long-awaited) switch from USB 2.0 ports to USB 3.0 ports at all price levels, you haven't seen anything yet. The cases in this month's roundup really run the gamut of features: from inexpensive chassis that attempt to deliver a lot of functionality without fattening up the price, to simple-looking enclosures that hide a wealth of must-haves, to some of the most eye-opening cases we've seen—that don't quite stack up once you look beyond their crazy offerings.

In other words, it's your typical case roundup.

Just to lay out our criteria a bit, here are some of the elements we typically look for when we run the magnifying glass over a case: features that take time and effort out of the installation or upgrade process, like screwless drive bays. Minimal annoyances—like having to snap off a case's entire front panel just to remove its drive bay covers. Adequate cooling, ideally positioned so that one's hard drives, video cards, and general motherboard area all receive a steady stream of air. And, of course, strong cable management: Nobody likes to open up a case and find Medusa.

Beyond that, the great case race is anyone's to win. As for how each manufacturer balances "cool" with "functional," you'll have to read on for all the gory details!



COOLER MASTER HAF XB

DON'T CALL THIS CASE 'STUMPY.' IT BITES

COOLER MASTER'S HAF XB case is a hybrid design that attempts to kill two PC birds with one stone: It's an open-air chassis for system builders who want to be able to swap out their components pit stop–style, and a standard, covered chassis for folks who like having four walls and a roof around their system's precious parts from time to time. For the most part, it works—but we would have loved to see a few tweaks to make the system even easier to use for the frequent parts-swapper.

The cube-like case leaves little room for error. Its 17.5x13x16.5-inch size is divided into a top and bottom half on the inside: Your ATX, microATX, or Mini-ITX motherboard rests up top—pray you don't have a huge cooler overtop your CPU, as you get just under 6.5 inches of vertical space (from the silicon on your motherboard) to play with, so forget about attaching a 20cm fan to the case's top. The bottom portion of the HAF XB is where you'll precariously thread your 7-inch-or-shorter power supply, connect up the case's two front hot-swap bays, stuff your optical drive in one of the case's two tool-free 5.25-inch bays, or slap some SSDs in the four additional 2.5-inch bays provided.

As for the hybrid bit we previously mentioned, Cooler Master has designed the open-air case to work just like that, with the system's sides and top bare to the world. However, when you want to transform the chassis into a normal, box-like enclosure, you just need to reattach the case's sides and top with the provided thumbscrews. While the process is certainly easy for those who have ever screwed-in a side panel before (that's most of you reading this), we wish that Cooler Master could have used the kind of thumbscrews that remain attached to the case (or panel) after you've loosened them. Losing those at a LAN party would be a real nightmare. That, or Cooler Master could have used quick-snap latches instead—an even stronger match for this Transformer of a chassis.



It's not very often you see a manufacturer going for the fabled, "cube design," but this is not your standard case by any stretch of the imagination.

The case gives you a lot of expandability for its size—including room for seven PCIe devices in all, and video cards up to 13.1 inches in length—as well as two USB 3.0 ports on the front and two beefy, 1,800rpm, 12cm fans directly behind that for air intake. If you're crazy enough to try water-cooling in the tight confines of this chassis, it does support a single 24cm radiator on the front, if you first remove the fans, in addition to a single 12cm radiator on the case's rear. While indentations on the rear of the chassis indicate a place where tubing *could* have been threaded, Cooler Master oddly omits any rubberized holes for doing so.

The Cooler Master HAF XB isn't for beginners. You're going to get to pretend you're a surgeon when you try to thread wires around the inside of this snug enclosure, even given the HAF XB's system-builder focus. It's still a compelling case for tinkerers that comes with plenty of useful features, and one that's worth looking into for folks afraid of (or uninterested in) making the switch to a fully open-air design. Just don't try to water-cool it.



The beauty of Cooler Master's split-insides concept is that you only have the annoyance of stringing cables around the lower half once. Most of the parts you'll likely manipulate sit up top.

VERDICT 8

Cooler Master HAF XB

$99, www.coolermaster.com

COOLER MASTER SCOUT 2

EASY TO CARRY, TOUGH TO COOL



THERE'S NO DOUBT in our minds that the design of Cooler Master's Storm Scout 2 chassis is going to draw eyeballs. On the outside, it's a beautiful case—punctuated ever-so-slightly by a red LED fan viewable through the case's windowed side panel, and ever-so-dramatically by the case's unique, rubber-coated steel handle up top.

The case's inside is less eye-catching. We love the three screwless 5.25-inch drive bays that merely require you to flick a switch from "open" to "lock" to secure your components in place. However, we're a little turned off by the flimsier rails that Cooler Master delivers to secure up to seven 3.5-inch hard drives in place; drive trays would have been better. Additionally, four of the drive bays have to go if you're using a video card that's larger than 28.7cm (approximately 11 inches)—and there's no easy way to just pull them out sans screwdriver.

Thumbscrews are your new friends for the case's seven PCIe expansion slots, and you'll have to install both standoffs and screws for your motherboard. That said, the Storm Scout 2 makes cable management easier with the five holes (three rubberized) Cooler Master cuts right into the motherboard tray—though they could have been a little bigger.

Our biggest problem with the Storm Scout 2 is its cooling—not due to its potential, as the case supports up to nine fans in total (a mix of 12- and 14cm fans, but mostly 12cm). Rather, the case ships with just one fan preinstalled: the aforementioned 12cm LED fan on the case's rear. You can toggle the light from on to off, as the flames shooting out from your hot components will be all the dramatic lighting you really need.

Two USB 3.0 and two USB 2.0 ports adorn the case's front, which you can hide with a little pull-down cover if you so desire. It's another one of the many tricks Cooler Master stuffs into the Storm Scout 2's hat; we just wish we could have some more fans, too.

Looks can be deceiving. From the outside, this case is a winner. But from the inside, we're a bit skeptical.

VERDICT 6

Cooler Master Scout 2

$99, www.coolermaster.com

MSI STEALTH

YOU'LL LOVE THE COLOR SCHEME, WE PROMISE



WERE THERE an award for "Best Case Color Scheme," MSI's Stealth would win by a mile with its lovely black-and-light-blue–accented aesthetic. As for the case's design, however, MSI packs in a few problems to balance out the good bits.

We never thought we'd have to struggle so much with this case just to get a simple optical drive secured into one of its three free bays. That involves popping off the front panel just so you can remove the 5.25-inch bay covers—annoyance number one—and then somehow using the case's big, blue locking mechanisms of fail to roughly secure your drive in place. Spoiler: They're not very secure.

MSI does provide full trays for the four hard drives the case supports, which alleviated our frustration somewhat. It also packs two graphics card stabilizers right above that—a fun and quasi-useful addition that allows the case to support video cards up to 12.2 inches in length—but some extra 2.5-inch bays might have been more useful.

What the case lacks in big, fat cable-routing holes (you get four small, thin ones), it makes up for in the ludicrous amount of space between the rear of the motherboard tray and the case's right-side panel. You could hide a garden hose in this case, not just your power supply cables.

Two fans are included in the front: a 12cm fan, and a similar-size blue LED fan positioned directly next to the hard drive bays. On the top of the case's front are two USB 3.0 ports, two USB 2.0 ports, and a special USB port that dovetails with your MSI motherboard's "SuperCharger" functionality for speedy device charging. If you haven't drunk MSI's Flavor-Aid, however, it's just a standard USB 2.0 connection. Great looks, polarizing design: The MSI Stealth chassis leaves us feeling a little blue.

Just wait until you pop off the side of this chassis: a pretty world of black-and-blue awaits you.

VERDICT 7

MSI Stealth

$99, us.msi.com

THERMALTAKE NEW SOPRANO

A SOPRANO COULD SING INSIDE OF THIS CASE AND YOU'D NEVER HEAR IT



This case might look fairly simple on the outside, but it has just about everything you'd ever want or need. Trust us.

FINDING A CHASSIS that successfully combines practical noise dampening, useful features, and cooling can be a bit of a needle in the haystack sometimes—but in this case (pardon the pun), that's Thermaltake's New Soprano. The solid construction of this chassis creates an upgrading or installation experience that's free of frustration. Our only complaint with the case, if you can really call it that, is that it lacks pizazz.

That said, give us function over pretty lights any day.

The jet-black exterior of the case uses a front-panel door to create a sleek, uncluttered aesthetic by allowing you to hide your components when you aren't specifically using them. The door doubles as an excellent noise-dampener and, we argue, a heavier-than-you-might-expect blunt object for use when squaring off against midnight intruders or zombie hordes.

Two USB 3.0 ports sit alongside two USB 2.0 ports on the top-front of the case; we're even more enthusiastic about the built-in hot-swap hard drive docking station for 2.5-inch or 3.5-inch drives that Thermaltake's constructed on the top of the chassis itself. It's a delightful and unexpected addition to the case that brings a lot of extra connectivity without harming the case's overall look or feel.

On the inside, Thermaltake uses four simple locking mechanisms to keep your 5.25-inch device held tightly. Installing an optical drive requires you to remove the drive bay's front panels—easily done without having to rip off any part of the case's front. Four screwless hard drive trays rest behind the case's secret weapon: a huge, blue-LED, 20cm fan that delivers plenty of air over your drives without blowing out your eardrums to do so. Above the primary 3.5-inch bays rests a single additional 3.5-inch drive bay and a single 2.5-inch bay for your solid-state needs (neither one screwless). Thermaltake positions the thumbscrews for the case's seven expansion slots on the exterior of the case. While that saves you a little room on the inside—giving the case space for a video card up to 12.2-inches in length—it also means that it's really hard to actually use your fingers to tighten or loosen the screws.



Thermaltake pulls out all the stops to make it as easy as possible for you to install or upgrade parts—minus the expansion slots, which will require a screwdriver.

Motherboard standoffs are built directly into the case—an excellent touch that saves would-be system builders a bit of time and hassle. A huge hole on the upper half of the motherboard tray exposes your CPU area for easier installation of aftermarket coolers, and that's joined by five other holes on the tray itself (four rubberized) for cable management. There's plenty of room between the rear of the tray and the case's right-side panel, even including the acoustical foam that Thermaltake's attached to the panel to give your ears a respite.

The only other fan in the case is a single, 12cm exhaust fan attached to its rear, and the only other fan you can install beyond that would be an optional 12cm intake fan on the case's bottom. That's the trade-off of having a "sound-proof" rig: more potential for heat. However, Thermaltake's done a masterful job of addressing this issue while building out a case that's packed with just about everything you'd want to have—assuming you care more about function than flash.

VERDICT 9 KICK ASS!

Thermaltake New Soprano VO900M1N2N

$120, www.thermaltakeusa.com

XCLIO TOUCH 787

MEET THE FUTURE, AND THE PAST, OF CASES

THIS KILLS US—it absolutely kills us. The Xclio Touch 787 has one of the most innovative, fun-to-use, Star-Trekian features we've ever seen on a case. And the substantial air-cooling it offers feels just a few miles per hour short of a category four. It's one of the few cases that we actually really *enjoy* interacting with on a daily basis.

But why, oh why, does Xclio have no idea how to build hard drive mounts?

Allow us to explain. The single most noteworthy and compelling feature of the Touch 787 is—as the name alludes—the giant touch-sensitive panel on front of the case's top. It looks as if it was ripped out of a standard *Star Trek: TNG* episode, and it functions about as well. After wiring up the panel with a standard Molex connection, you can tap its huge, circular buttons to turn the case's fans on and off; adjust their speeds to low, medium, or high; turn the fans' lights on and off; or lock and unlock the panel itself (to prevent accidental bumping).

Call it gimmicky if you want, but the responsiveness of the controls—and the pretty blue lighting when you've activated an option—is just downright cool. Unfortunately, Xclio seems to have spent most of its R&D effort on just that—the panel. Or perhaps the fans, as this system comes with no fewer than 10 12cm fans in total: one on the case's rear, two on the top, one in the front, and six (!) on the case's side panel. Cooling overkill? Yes. We appreciate the enthusiasm, but one large fan on the side panel (for example) could have pushed plenty of air at a lower RPM and noise level.

All the standard features on this case are the same as what you'd expect to find in this price range: cable-mounting holes, motherboard tray cutouts behind the CPU, locking mechanisms for the case's three free 5.25-inch bays, etc. We're not going to waste words going over these, simply because the design of the case's 3.5-inch bays—or lack thereof—presents a critical flaw in any user's enjoyment of this wind tunnel of a chassis.

To access the case's two actual hard drive bays, you have to unscrew and take apart a ridiculous bar of sorts that runs vertically from the case's bottom to just under its 5.25-inch bays. What's more, Xclio actually wants you to mount your drives to this bar, as well, just floating out there in mid-air. Presumably, Xclio wants to put nothing between the intake fan and your system's motherboard, but it's a bad design concept that's ugly for cable management, annoying to work with, and makes absolutely no sense whatsoever: It's the very definition of, "If it ain't broke...."

If it wasn't for Xclio's choices in designing its mounting "system" for hard drives, we'd consider this case—loud and over-the-top as it is—to actually be worth considering, if for nothing other than its uniqueness. The more we think about it, however, the more Xclio's design decisions hint at a company that doesn't actually know how to build a functional case, just a really cool-looking one.



Words fail us. The touchscreen controls on this case must be seen to be believed.



It's too bad that Xclio didn't put some more thought into this case's internals. As is, they're not very good.

VERDICT 5

Xclio Touch 787

$150, www.xclio.com

The Battle of the Budget Cases

Want a case on the cheap? Be sure you *don't* get what you're paying for...

Here we go—a descent into the budget barrel. It's understandable that you might be a little concerned about the quality of offerings you're going to see in the sub-$100 case market. You have every right to be: Just go to your local geeky retailer of choice and check out some of the horrible cases on the shelves that get offered at rock-bottom prices. We wouldn't want to put our worst enemy's motherboard into those.

Of course, you can find some real diamonds in the rough, but you're definitely going to have to do a little digging to uncover quality, inexpensive cases—especially given the sacrifices manufacturers typically have to make in order to hit these low price targets. We've dragged up two of these budget cases to show you just what we mean by the differences you'll find at this end of the spectrum: Take a look!

ANTEC ONE

One...singular sensation is not this chassis. The mid-tower Antec One feels a little flimsy in a few areas, which detracts from some of the better elements in this ultra-inexpensive case.

The Antec One comes with three 5.25-inch bays that use pre-attached locking mechanisms to keep your devices all snug and attached. However, this is the kind of case that requires you to pop off the entire front panel in order to remove the grilled covers over the empty bays—be careful with that, as we definitely broke off some of the tabs on these covers when trying to remove them ourselves.

Antec positions the entrance for the case's five 3.5-inch bays on the right of the case, if you're looking at it from the front, rather than the left. This decision boggled our minds at first, but the more we thought about it, the more sense it made: You would have to pop off both sides of the case anyway were you to install the drives from the left side of the chassis (using the provided rails) and this method allows Antec to build in some additional space for much-needed cable management. It's just a little weird at first.

The case's seven expansion-card brackets don't come with screws preinstalled into the case—a bit of an annoyance for those looking to ensure that the flimsy tabs stay on at all times. We do, however, like the recessed side pane that sits behind a huge hole cut out for the top half of one's motherboard: Cable-management and CPU cooler installations are a breeze.

Antec slaps two 12cm fans in the top-rear corner of the case; none over the hard drives. You get two USB 3.0 ports on the case's front; that's it. That's the Antec One: a price-conscious chassis that's good in a pinch, but could be a lot better.

VERDICT 6

Antec One

$49, www.antec.com



The Antec is light enough that you could probably balance it on your fingers and spin it like a basketball. (YouTube that, if you try).

CORSAIR CARBIDE 200R

Delightful. Truly delightful. That's the best way to sum up Corsair's sub-$100 Carbide 200R mid-tower chassis. It's roomy, it's well-designed, and—most importantly—it doesn't invite any annoying features or ill-designed elements along for its inexpensive ride.

All of the Carbide 200R's drive bays are completely screwless, a wonderful touch for those looking to make modifications to their system without busting out the toolkit. Popping off the flat, solid panels covering the case's three 5.25-inch bays is easy and destruction-free—almost as easy as it is to slide and lock up to four 3.5-inch hard drives into the case's left-facing bays. You can use screws to attach up to four 2.5-inch drives into a provided internal enclosure if you really don't want your solid-state drives to jiggle.

Motherboard standoffs are built directly into the Carbide 200R: Just slap down your board, grab a few screws, and you're set. Five different cable-routing holes cut directly into the tray make it easy for you to hide your ugly wires, and a large area cut out behind the top of the motherboard tray speeds along the (often agonizing) process of aftermarket CPU cooler installation.

The case comes with one 12cm fan in the rear and one in the front. While we would have preferred that the front fan was placed to push some air over your hard drives, at least it's able to direct much-need cooling on your video card (up to 11.8-inches long). You can also stick up to five additional 12- or 14cm fans around the case's top, side, and bottom, as well as one more 12cm fan in the front (covering your hard drives).

The case comes with two USB 3.0 ports on the front—more importantly, popping off the front panel to do any modifications to the Carbide 200R doesn't result in a tangle of wires coming with it. It's these little touches, and more, that make this case such an inexpensive delight. ⏻

VERDICT 9

Corsair Carbide 200R

$60, www.corsair.com



The Carbide 200R doesn't win huge points for its looks, but there's a lot going on inside this chassis for its low price.



TRACK DOWN!

DON'T LET A LOST OR STOLEN LAPTOP RUIN YOUR LIFE—NOT WHEN THERE'S TRACKING SOFTWARE THAT CAN BAIL YOU OUT

By Matt Hanson

LOSING A LAPTOP, whether by misplacing it or by theft, can be devastating. Not only is the financial loss tough to get over—laptops aren't cheap, after all—but the loss of personal files, documents, photos, and other data can be even more upsetting. It can also be potentially very dangerous, as any criminal who snatches your laptop could then have access to your email or online banking accounts, which combined with other personal data on your laptop could make you a prime target for identity theft.

Thanks to laptop security and tracking software, the fate of a stolen laptop needn't be so dire. This month, we've rounded up eight programs intended to add an extra layer of security to your laptop should disaster strike. At the very least, they should allow you to remotely lock down your laptop and wipe sensitive data. In a best-case scenario, such software will allow you to track and retrieve your laptop and, if it's been stolen, provide evidence to the police for a conviction.

Can the software we've rounded up deliver on these promises? Let's investigate.

IT



EXO5

Biz package spies on, er, tracks many devices

EXO5 IS PRIMARILY geared toward small-to-medium businesses, but that shouldn't put off home users—especially if you have a number of devices you want to keep track of.

A free 30-day trial lets you sample the goods before purchasing. After signing up for an account, you'll head to the Settings tab of the Administrative Console and download the Agent Installer, a standalone .exe file that needs to be run on any device you want EXO5 to track. Once done, you can view the devices by clicking the Assets tab.

When you select an asset to track you'll be shown its location on Google Maps, using similar Wi-Fi triangulation technology as the other services we've tested here. In EXO5's case, it got the road right but was a few buildings off, while some of its competitors were more accurate. The public IP address is also displayed, along with whether the device is connected to the Internet.

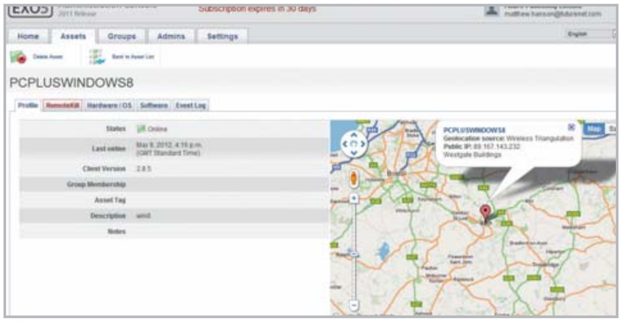
The Hardware/OS section lists your devices' hardware configuration, and isn't much use unless you need to see if someone has swapped any of the parts in your laptop.

The Software tab offers more illuminating details of what programs have been installed on the laptop, while Event Log keeps you up to speed on what your laptop's being used for. Most of these features cater to an individual or company that wants to make sure the laptop is being used for its intended purposes.

Of most value is the incredibly handy RemoteKill option. This enables you to encrypt files and folders remotely if the laptop is stolen. Presets such as "All Microsoft Outlook .pst files" make it quick and easy to secure important info. You can also add a boot-sector lock to shut down the device—and both can easily be reversed if the laptop is recovered.

FEATURES

RemoteKill file encryption, drive lock, curfew, geolocation, logs, data export, RiskSense alerts



EXO5 uses geolocation to track your devices with a fair degree of accuracy.

VERDICT 7

EXO5

$495/3 years on 25 devices, www.exo5.com

FRONTDOORSOFTWARE

Protection that makes itself known

FRONTDOORSOFTWARE is a laptop protection and tracking tool that, despite being free to download, comes with some of the features found in paid-for software.

While our evaluation is focused more on how well a program protects a laptop, and not on aesthetics, we still must point out the noticeable lack of user-friendliness of FDS's design, which makes relatively simple actions more complicated than they need to be. A case in point: The installation process includes a slightly bewildering SetLicense window with a number of buttons and text boxes and little to no description of what each one does. Spelling mistakes in the online instructions don't inspire confidence either.

Once installed, our laptop had to be rebooted and afterward sported a FrontDoorSoftware window with a warning that the device was protected, alongside the usual Windows login screen. You can also send a custom message to the screen. However, that alerts thieves that they need to act fast to remove the software. Your contact information is also displayed in case the laptop is simply lost, so a good Samaritan can contact you to return it.

FrontDoorSoftware uses Wi-Fi positioning technology courtesy of Skyhook (www.skyhookwireless.com) and the results were respectable, with the approximate location just 60 yards off. However, the software runs as a second-user account, so it has an impact on the system's performance. You can remotely lock the device and mark it as stolen through a web interface, which can only be unlocked with a code.

FEATURES

Geolocation, stolen alert display, remote lockdown, start-up audible prevention alert, custom text message



FDS allows you to send a custom message to be displayed on a stolen or missing laptop.

VERDICT 6

FrontDoorSoftware

Free (or $30/3-year license with unlimited location tracking), www.frontdoorsoftware.com

GADGETTRAK

Tracks with frequent reports and sly webshots

GADGETTRAK protection involves downloading and installing the software onto your laptop and registering it with your GadgetTrak user account. You can then log on to www.trak.me and use the control panel to enable tracking. You'll get email reports every half hour, with various bits of information to help you locate a missing laptop.

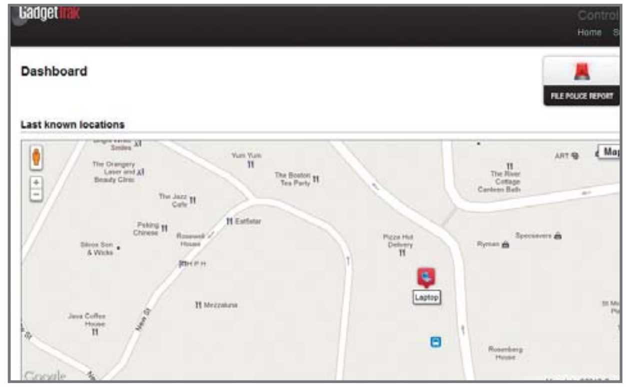
Arguably the most useful part of the report is the Wi-Fi-based location section, which provides you with the latitude and longitude of your device's location based on its Wi-Fi connection and the networks surrounding it. There's also a handy link to Google Maps with an icon indicating the approximate location of your device.

In our tests, the location information was a couple of buildings off of the actual location. While it's not pinpoint-accurate enough to go and retrieve your laptop there and then—not that you should attempt to if it's been stolen—you'll at least have an idea of its general vicinity.

Occasionally, the location would jump around a bit, pointing in roughly the same area but giving the impression the device was being moved about when it actually wasn't. The report also includes a snapshot taken with the laptop's webcam, and will hopefully catch the thief using the laptop at that moment. However, you can't choose when to take snapshots and there's no option to change the frequency of the reports.

FEATURES

Wi-Fi positioning, webcam support, integrated police reports, online dashboard



If you're lucky, GadgetTrak will use your laptop's webcam to snap a pic of the perpetrator.

When turned off, the laptop can't send tracking info, but as soon as it's turned on you'll get a report. While GadgetTrak does not appear in the Windows Start menu or in the system tray, it can be seen in the Uninstall Programs window—though you need an admin password to remove it.

VERDICT 7

GadgetTrak

$20/year, www.gadgettrak.com

LOJACK

The master of tracking—almost

LOJACK IS definitely focused on home users. This is evident not only in the easy and simple installation, but also in the onscreen pop-ups. Designed to be reassuring—with reminders that your laptop is protected—they are no less annoying than any other pop-ups. Luckily, the program is very good at what it does.

Once installed, you need to create an account on the LoJack website, enable geolocation tracking, and create a PIN. A map view shows your device's location and there are four tabs that divvy up the planned recovery of your device: Locate, Lock, Delete, and Recover.

While many services rely on Google Maps, LoJack opts for a map powered by Esri. It looks good but there's no easy way to zoom in to get a more specific idea of where your device is, just a big red dot that, for us, covered quite a large swath of land. Above the map, there's a Device Status indicator that should update itself every 24 hours, so you know that LoJack is still installed.

The Lock part of the process requires you to input your PIN, enter a message, then click Lock Device. The locking process isn't instant—it took about 20 minutes for us. When it did lock, we were notified by email. While useful, the locking software isn't entirely secure, but there's also support for Intel hardware locking (if your device supports it).

FEATURES

Geolocation, customized lock-out message, remote lock, remote delete, Theft Recovery Team



The Esri mapping system that LoJack uses is less nuanced than Google Maps.

Remote deletion of your important data is run in the Delete section; in the Recover section, the laptop can be marked as stolen and a Recovery Team is notified and will begin collecting evidence to hand over to the police.

Indeed, despite its minor weaknesses, we felt confident that LoJack had us covered

VERDICT 9 KICK ASS!

LoJack

$40/year, www.absolute.com/lojackforlaptops

PREY

An open-source protector of your PC

AS WE SAW with FrontDoorSoftware, Prey proves that just because a product is free doesn't mean it's lacking in features. Indeed, this is a feature-rich and stable open-source program, and evidence that there are a lot of very talented coders out there.

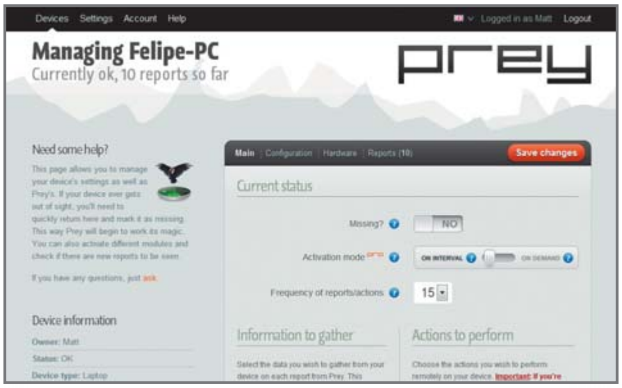
First impressions of Prey are that it has a professional and good-looking interface that manages to easily eclipse FrontDoor-Software. When launching the software for the first time, you're required to set up how Prey sends you reports—either by email and web, or email only.

The web control panel is excellent, with a clear and attractive interface. Settings can be easily configured via sliding toggles, similar to those found on iOS devices. Designating your laptop as "Lost" will instruct Prey to begin creating reports on its location and send you email notifications. The frequency of these reports and emails can be altered easily, which makes the absence of this capability in GadgetTrak all the more baffling. What GadgetTrak does have over Prey, however, is that GT's reports are included in the email notifications, while Prey only offers a website link.

The reports themselves are very good, though, with Wi-Fi-based location (again pretty accurate), and webcam support. A very handy feature not found in many other laptop security suites is that Prey also takes a screenshot of the laptop. It's a great addition, and if you're lucky, the thief could be on a site that will help with identification, such as Facebook. There's even more information included in the reports, which makes Prey easily one of the best laptop security applications we've tested. And it's free.

FEATURES

Wi-Fi auto-connect, GPS and Wi-Fi geolocation, small memory footprint, webcam and screenshot capture, remote data removal, remote lockdown



Prey lets you determine the frequency at which the program mails you reports on a lost or stolen device.

VERDICT 9

Prey

Free, http://preyproject.com

MYLAPTOPGPS

Uses IP and not GPS for tracking

ONCE YOU'VE set up a MyLaptopGPS account and installed the software, it will run silently, so thieves will have no idea that your laptop is being tracked. As with the other products we've reviewed here, you can track your laptop via an Internet browser.

The interface is rather bland and lacks the friendly style of Prey, but it's easy to navigate. You can quickly designate the laptop as stolen, which turns on tracking and a few unique features. You'll receive email updates about your laptop, with a reassurance that the "SafeRecovery Team is pursuing the recovery of this machine." Also, a window will pop up on the laptop claiming, "This machine is globally tracked via permanently embedded GPS."

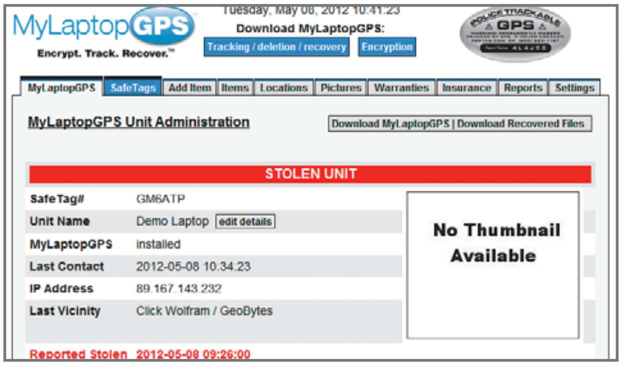
While this message lapses into hyperbole, it could encourage thieves to abandon or even turn over the laptop. There's even a phone number to contact. The window sits on top of other windows, which could also prove annoying for thieves—except that it can be closed easily through the task manager. Once closed, any thief would know the device is being tracked and reinstall the OS.

MyLaptopGPS offers a workaround of sorts. You can identify important files you don't want to lose and when you flag your laptop as stolen, MyLaptopGPS uploads those files to a location on the web, emails you a link, and then deletes them from the laptop.

Though MyLaptopGPS has GPS in the name, it relies on the much less accurate IP address registration to locate laptops. Where other services use Wi-Fi positioning to get a more accurate location, the IP address registrant just gave us the city of the IP address—which wasn't even the city the laptop was in.

FEATURES

IP location tracking, remote data recovery, remote delete



Once you've identified your laptop as stolen, a message will pop up letting the thieves know they are being tracked.

VERDICT 8

MyLaptopGPS

$10/month, http://mylaptopgps.com

THE LAPTOPLOCK

Free package offers solid basis for security



With an emphasis on data protection, LaptopLock lets you designate files and folders for deletion or encryption in case of theft.

LAPTOPLOCK IS a free offering that eschews a fancy interface for a simple, no-frills look. Signing up for the service is quick—you simply need to enter your email address and a password, and you're taken straight to the online control panel. From there you can add a computer, giving it a name for easy reference, then download the software. During installation you can choose whether or not to show a splash screen when the laptop starts up—it's nice that you're given the choice.

There are no tracking features with this program, so ideally it should be installed alongside a free service that does that, such as Prey. What LaptopLock concentrates on is protecting your data if your laptop is lost or stolen. It does this in three parts. The first part is file security: You can select files you want LaptopLock to delete if you flag your laptop as stolen via the web interface. Choosing the files and folders is very easy, and you can select to securely delete the data, so that data recovery tools can't access it. If you're not too keen on the scorched-earth policy, you can choose to encrypt the files instead.

The second part is notifications: You can choose to show a message or play a sound when the missing laptop is in use. The final part is that you can select a program to launch when the laptop is reported stolen—a good opportunity to run a tracking program, or activate your webcam and upload the photos it takes. The laptop can also be marked as stolen, notifying a recovery team that will begin collecting evidence to hand over to the police.

LaptopLock may appear simple, but with it you can make your own laptop security solution.

FEATURES

Remote delete, remote encrypt, show a message to the user, execute a program, play a sound, visible or hidden from user

VERDICT 8

The LaptopLock

Free, www.thelaptoplock.com

MYLAPTOPTRACKER

Stealthily keeps tabs on your machine



By remaining hidden from view, MyLaptopTracker won't tip off a thief that he or she is being watched.

INSTALLATION OF MyLaptopTracker is very easy, with just a simple download and install of the software. You're then taken to a web page with a big bright Start Tracking button. Once initiated, you can leave it to track your laptop quietly. There's no sign that MyLaptopTracker has been installed on your laptop; even the Uninstall Programs window shows no trace of it. In fact, the only way to get to MyLaptopTracker on the laptop you want to protect is by opening the Run command window and typing **mydevicetracker**.

Once in the program, you can select a number of neat features, such as a folder with important personal files that you can hide or, in case of theft, delete. You can also trigger this action if the laptop can't connect to the Internet after a set amount of days—though there are obvious drawbacks to this.

Two welcome features are the ability to alter the time between email notifications and to upload images taken with the laptop's camera to a Flickr or ImageShack account.

The interface for the desktop program is clear and easy to understand and took us very little time to set up, but the web interface is rather sparse. There's no denying that the simplicity of turning tracking on and off via a single button is nice, but the limited web interface can end up being rather annoying as you wait anxiously for a report.

FEATURES

Stealth mode, one-click tracking, Wi-Fi positioning, webcam image capture and Flickr integration, remote data retrieval

VERDICT 7

MyLaptopTracker

$30, www.mydevicetracker.com

TRACKING SOFTWARE COMPARED

	EX05	FrontDoor Software	GadgetTrak	LoJack	Prey	MyLaptopGPS	The LaptopLock	My LaptopTracker
Price	$495/3 yrs	Free, or $30/3 yrs	$20/yr	$40/yr	Free	$10/mo	Free	$30
Wi-Fi Positioning	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Webcam Support	No	No	Yes	No	Yes	No	No	Yes
Online Dashboard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Email Reports	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Send Custom Messages	No	Yes	No	Yes	Yes	No	Yes	Yes
Remote Data Wipe	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Remote Lock	Yes	Yes	No	Yes	Yes	No	Yes	No

THE TRACKING CHAMPS

HOPEFULLY, BY READING through this roundup and learning about all the many tracking features that are available, your interest in setting up some proper security measures for your prized devices has been piqued. Besides, you don't want to miss out on posting screenshots of a thief online.

Sometimes in a roundup that includes both free and paid-for software there can be a huge gulf in quality between the two. But sometimes we see free products that offer just as many features—and perform just as well—as their competitors that charge. This is one of those roundups where the free, open-source Prey easily competes with—and in some cases surpasses—its paid-for rivals.

If you were to take a quick look at Prey, you wouldn't think it was a free tool at all. It boasts loads of features, looks great, and works extremely well. Once again, the open-source community has shown that talent and passion can turn an altruistic project into something truly special. With so many features, Prey is the best value laptop security package around.

When a free program does such a good job, it can often feel like a bit of an open-and-shut case—after all, why pay for something when a freebie will do the trick? The results were not so clear cut, though, as LoJack still offers a compelling reason to lay down some cash. LoJack's easy-to-navigate interface, along with the way it splits the laptop security and recovery process into four steps, make it a quick and reassuring tool to use. While there are free services out there, the subscription you pay for LoJack offers peace of mind that the service will still be there when you need it. Dedicated support and recovery are on hand to help you, as well.

So, in the end, there are two clear tracking-software winners: LoJack representing the paid-for software and Prey winning the free software choice.

> “OPEN-SOURCE PREY EASILY COMPETES WITH—AND IN SOME CASES SURPASSES—ITS PAID-FOR RIVALS

ifixit presents:

AUTOPSY

THIS MONTH WE DISSECT...

Nikon D600



About iFixit

iFixit is a global community of tinkerers dedicated to helping people fix things through free online repair manuals and teardowns. iFixit believes that everyone has the right to maintain and repair their own products. To learn more, visit www.ifixit.com.



BACKGROUND:

With the release of a "budget" full-frame camera, Nikon hopes to lure the mid-level/prosumer camera junkies into taking the full-frame plunge. Unfortunately, a "budget" full-frame camera still means a price tag of $2,100, so it's not exactly a bargain. Here's what you get for the dough.

MAJOR TECH SPECS:

- 24.3-megapixel FX full-frame CMOS sensor
- 5.5 frames-per-second continuous shooting
- ISO 100–6,400 (expandable to 25,600)
- 3.2-inch TFT LCD
- Dual-SD card slots
- Lots o' ports: headphone jack, stereo microphone input, Hi-Speed USB, HDMI out, GP-1 GPS unit input

HIGHLIGHTS:

- Chipworks (www.chipworks.com) helped us identify the sensor inside the D600. It's a Sony unit that measures 35.9x24mm.

- Multiple hidden screws hold the body of the D600 intact. We found the little Phillips buggers hiding under the eye cup, rubber grip, and viewfinder diopter dial, in addition to the exposed screws residing on the bottom cover.

- It's nice to see that the D600 tripod mount comes out separately from the rest of the body. It would be a shame for a $2,100 camera to be compromised just because the mount became cross-threaded.

- The depth-of-field preview and function buttons both lay inside the front case underneath two rubber covers. Though not a common repair, replacing these buttons is certainly feasible.

- The battery grip also pops off somewhat easily. That's another component where replacement is feasible, which is great news for photographers who grip tightly to their SLR and wear it out prematurely.

- We were disappointed to find that the LCD is fused to the rear case, and cannot be swapped without replacing the entire back of the camera.

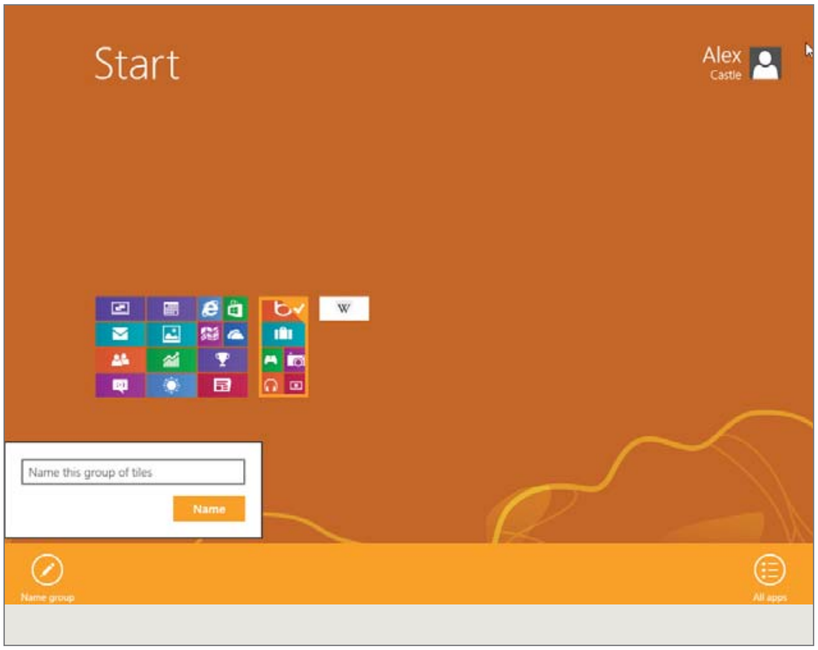
- Luckily, the main EMI shield is removed by simply unscrewing some Phillips screws, and does not require any desoldering. A large square of thermal compound also tips us off that this shield works double-duty as a heatsink, removing any excess heat from the D600's motherboard.

- In true SLR fashion, the D600 scored a very low 2 out of 10 repairability score, as most components almost require a certification in soldering in order to properly remove them.

HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

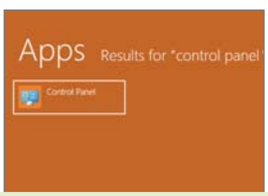
WINDOWS TIP OF THE MONTH



NAME METRO ICON COLUMNS

You probably know that you can organize your Windows 8 Start Screen icons into columns, but you might have missed that you can give those columns names, as well. To do so, click the minus icon in the very bottom-left of the Start Screen, then right-click the column you wish to name, and finally, click the Name button in the menu at the bottom of the screen.

MAKE - USE - CREATE







ALEX CASTLE
CONTRIBUTING EDITOR

CORNER CASES

OF THE NEW features in Window 8, the one that's taken me the longest to get used to has been the new hot corners, the OSX-like feature that allows you to access various navigation features by moving your mouse to the various corners of the screen. In addition to activating the hot corners by accident more often than I'd like to admit, it took me a while to remember that they were available when I actually needed them. If you're in the same boat, here's a quick refresher, along with two hot-corner features you might not know about:

- **Top- or bottom-right corner:** Show the Charms bar
- **Top-left:** Show thumbnails of running programs
- **Bottom-left:** Start Screen shortcut
- **Right-click bottom-right:** Peek at desktop (desktop mode only)
- **Right-click bottom-left:** Show the Power User Menu, a useful collection of shortcuts to places like the Control Panel and Device Manager

↘ submit your How To project idea to: comments@maximumpc.com

Build a Home Server with Windows 8

YOU'LL NEED THIS

WINDOWS 8
Microsoft's latest operating system is designed to handle both your personal computing and home server needs.

THAT WINDOWS 8 is a major shift in strategy for Microsoft is pretty old news at this point. Between the Modern UI, a complete dismissal of the Start menu, focus on touchscreen devices, and myriad other changes, it's clear that this is not the Windows of the Bill Gates era. One factor that hasn't received much attention is that of Windows 8 being Microsoft's next iteration not only for Windows 7, but also for Windows Home Server.

If you haven't heard, Windows Home Server has been discontinued by Microsoft. For those not familiar with WHS, it was designed to be the central hub of your home network—providing easy access to large amounts of easily expandable storage, simple backups, media functionality, and synchronization of usernames and passwords throughout your home network. The good news is that Windows 8 provides much of the same functionality previously found only in Windows Home Server.

This guide will show you everything you need to know to build a Windows 8 home server. –TIM FERRILL

1 **CONFIGURE STORAGE** Windows 8 offers some new tools for configuring large amounts of redundant storage that may seem familiar if you've used Windows Home Server in the past. The Storage Spaces feature lets you group multiple physical hard drives together into a single storage pool and even provides options for redundancy. Taking advantage of Storage Spaces is probably a good idea even if you only have a single drive at the moment, given its ability to dynamically expand the size of your volume as you add more drives, much like the Drive Extender feature familiar to WHS users.

» To begin configuring Storage Spaces, you need to access the Control Panel, which can be a little tricky in Windows 8. The two easiest ways we've found to get there are:

» 1. Go to the Start Screen, type Control Panel, then click on the Control Panel shortcut (**image A**).

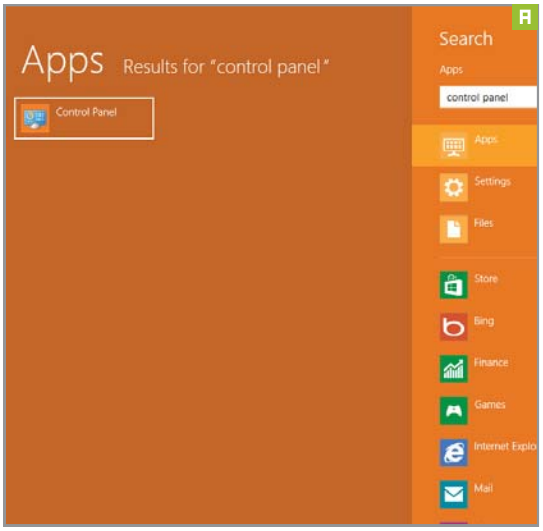
» 2. Move your mouse cursor to the bottom-left of the screen to bring up the Start Screen shortcut, right-click the shortcut, and choose the Control Panel option (**image B**).

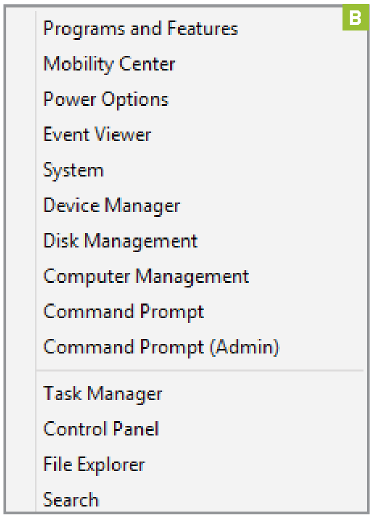
» Once you've navigated to the Control Panel, you can find Storage Spaces under the System and Security category. The first step in getting Storage Spaces up and running is to create a storage pool and add physical drives to the pool. One thing to know is that storage pools use the full capacity of your hard drive, so if you have existing data it needs to be copied off before you add the drive into a storage pool.

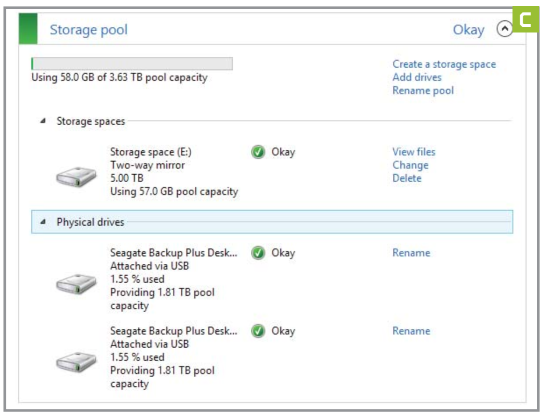
» Within the Storage Spaces applet in the Control Panel you should see a link that says, "Create a new pool and storage space." Click this link and confirm the User Account Control pop-up to begin adding drives to your storage pool. The next screen will ask you to choose the drives to use in your storage pool (**image C**). Select the drive or drives you want to use and click the "Create pool" button at the bottom of the window. Notice you can use any combination of internal and external drives to create your storage pool (we're using two 2TB Backup Plus Desk drives from Seagate connected over USB 3.0).

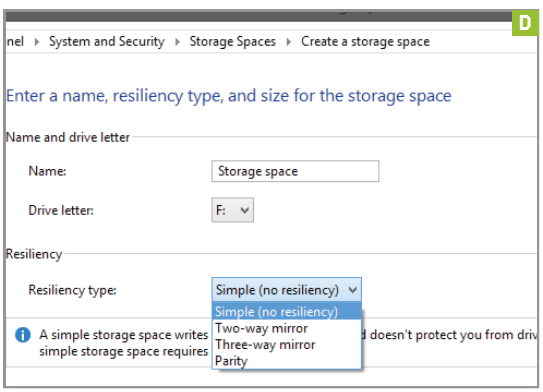
» Once the storage pool is created, we move on to creating a storage space. There are several options when creating a storage space, some of which require some additional explanation. The name and drive letter are probably obvious to *Maximum PC* readers; these dictate how the storage space is displayed in File Explorer. You would think the pool size would be another obvious option, but storage spaces can be configured to be larger than the amount of physical storage you have available. To be clear: This is not usable space, but it does allow you to create a large storage space and expand through new physical drives as needed.

» Resiliency is probably the most confusing of the storage space options (**image D**). A storage space can be built to protect against drive failure by storing a duplicate copy of your data on more than one drive in a mirroring configuration. The caveats to using resiliency are that you must have multiple drives in your storage pool and the maximum storage capacity is reduced because some of the drive space is being used for resiliency. A storage space can even be configured to store an additional copy of your data in a three-way mirror. Sadly, you cannot add or change the resiliency configuration of a storage space simply by adding another drive at a later date. What you can do later is add additional drives, configure a new storage space with resiliency, and then move your files to the new storage space. Also keep in mind that you can have multiple storage spaces in a single storage pool. This means you could have a resilient storage space mirroring your important documents, and a second storage pool with no resiliency used for music or videos that you could recover through another method.









2 SHARE FILES

SHARE FILES Microsoft introduced the HomeGroup feature in Windows 7, and it's returned in Windows 8. The feature allows you to set up a relationship between the Windows PCs on your network, and eases the process of sharing files and devices between computers. There are two parts to sharing files using HomeGroups on your network.

» First, we need to create the HomeGroup and add computers. HomeGroup settings can be found in the Control Panel under the Network and Internet category. If there is already a HomeGroup on your network, you will be invited to join the existing HomeGroup, otherwise you will be prompted to create a new HomeGroup. There's really not much to creating the HomeGroup. The system will generate a password that you must use to join other computers to the group (**image E**). This password can be changed later to something you can remember.

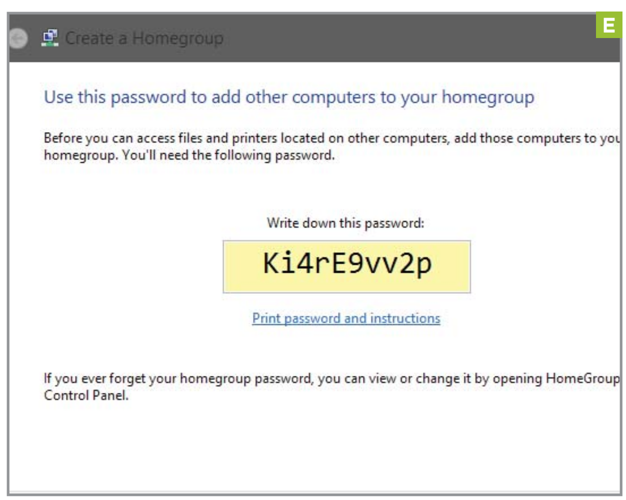
» Sharing files using a HomeGroup is most easily done by using Libraries. The HomeGroup Control Panel allows you to choose which libraries get shared with other users in the HomeGroup. If you want to simply share a single file it can be done by adding it to a shared library.

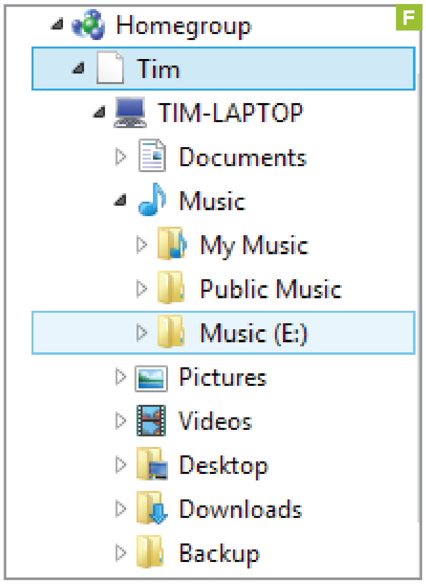
» For our scenario, we're looking to share entire folders within our new storage space. By creating Music, Video, and Pictures folders we can easily organize our media files. Additionally, we can add these folders to the existing libraries by simply right-clicking and choosing "Include in library" to start sharing them to the HomeGroup.

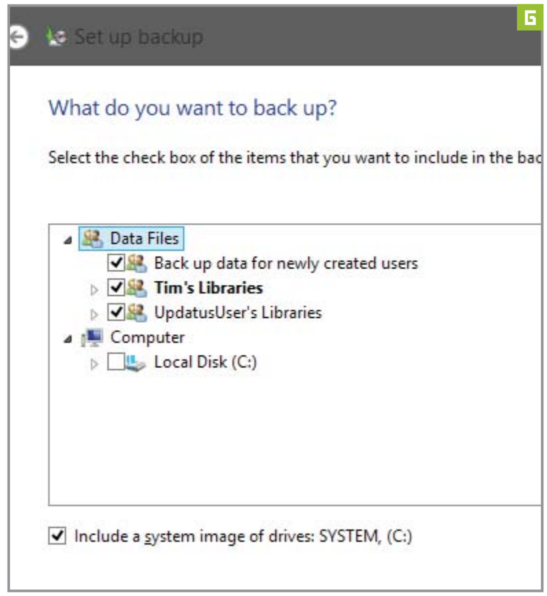
» Sometimes we don't want to do things exactly the way Microsoft designed, so using the existing libraries isn't always going to be a workable solution. Fortunately, you can add libraries and then share them with the HomeGroup or simply share an individual folder without using the libraries. To test this, let's create a Backup folder in our storage space. Once the folder is created, right-click the folder, choose Share With, and choose HomeGroup (**image F**).

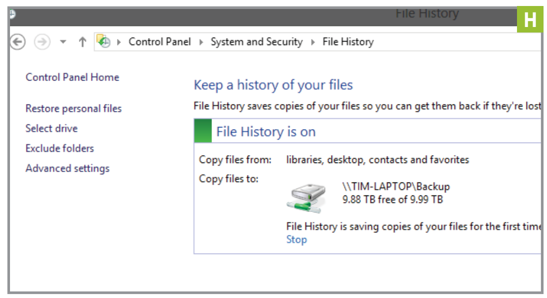
» Now that we've created our HomeGroup and shared all of our files, open up File Explorer (this is another option in that power user menu we showed you earlier). In the left panel of File Explorer you should now see a HomeGroup section with your username underneath. Expanding your username should show the computers you have access to, and should provide a list of shared folders on that computer.

» Another feature of a HomeGroup is the ability to stream media over the network using DLNA. This can be configured using the Media Streaming options in the Network and Sharing Center Control Panel. The media streaming options will let you allow or disallow individual media devices on your network from accessing certain types of files.









3 PROTECT YOUR DATA One thing we can't recommend highly enough is backing up your data. Few things are worse than losing years of pictures or documents because of a failed hard drive or accidental deletion. There are two aspects of data protection we want to take a look at: using your Windows 8 server as backup storage, and backing up the storage volume itself.

» Using your Windows 8 server as backup storage is as simple as using the Backup folder we created earlier as your storage volume. This can be done with most backup tools, including Windows Backup and File History (which we'll talk about in a minute). Interestingly, Windows Backup is a deprecated feature in Windows 8, which means two things. First, it's hard to find. Second, it's a feature that may disappear completely in future versions of Windows.

» To use the traditional Windows Backup features in Windows 8, go to File History in the System and Security category. Once there, you will see an option for Windows 7 File Recovery in the bottom-left corner of the window. Another option is to switch to the Control Panel's icon view and find the Windows 7 File Recovery option there. Once you are in Windows Backup/Windows 7 File Recovery, you can create a system image, back up your libraries, or choose individual folders to back up (**image G**). These steps can be used to back up other computers to your central storage or to back up your centralized files and folders to another location.

» Another option for backing up critical files in Windows 8 is using the File History feature (**image H**). File History is primarily used for backing up files from other computers to your centralized storage, but it offers some increased flexibility over traditional backups. File History can be configured by simply choosing the backup location and turning the feature on. In addition to having a backup copy of your files, you also have the ability to open a previous version of a file. This is particularly handy if you've accidentally deleted something contained in a file, such as paragraphs from a document or a slide from a presentation.

» Windows 8 is certainly a shift from previous versions of Windows, but it's not all about the new interface and the start screen. If you know where to look, there are some sweet new features that open up new possibilities in how we use our computers on a daily basis.

Create a Windows 8 Virtual Machine

YOU'LL NEED THIS

A WINDOWS 8 ISO
You can download one if you've purchased Windows 8 from Microsoft, or you can download a free, limited evaluation copy from bit.ly/Po8wWc.

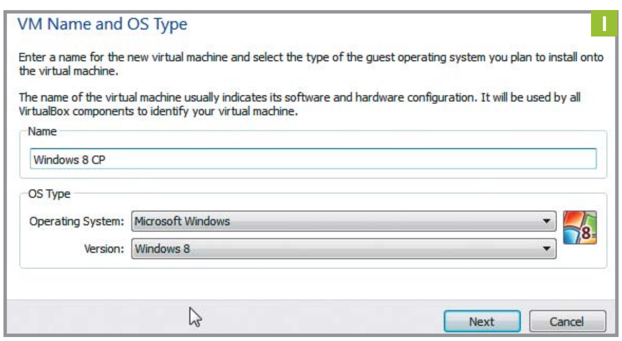
VIRTUALBOX
Free virtualization software from Oracle, available at bit.ly/rnbvIM.

VIRTUALIZATION IS an ideal tool for trying out a new operating system. Instead of installing the OS onto a live machine and potentially overwriting or generally screwing up a working system, virtualization lets you run the new OS in a sandbox, leaving your current installation untouched. You'll need a processor that supports hardware virtualization, but as long as your PC is reasonably up to date, this shouldn't be a problem.

In order to run a virtual version of Windows 8, you'll need the ISO. You can buy a copy of Windows 8 from Microsoft, or you can download the evaluation version, which expires and cannot be upgraded. Grab the 32-bit, just because it's less exacting in terms of specs. You'll need the virtualization software for the host machine, as well. For this tutorial we're using Oracle VirtualBox, although the setup is similar for Microsoft Virtual PC (available at bit.ly/19LO5i). –ALAN DEXTER

1 GET STARTED Download VirtualBox and run the installer. When it's done, run VirtualBox, then click New to create a new virtual machine (or VM for short). Give your VM an obvious name like "Windows 8," then select Microsoft Windows as your OS type and Windows 8 from the drop-down menu—or Windows 8 (64-bit), if you've chosen that route (**image I**).

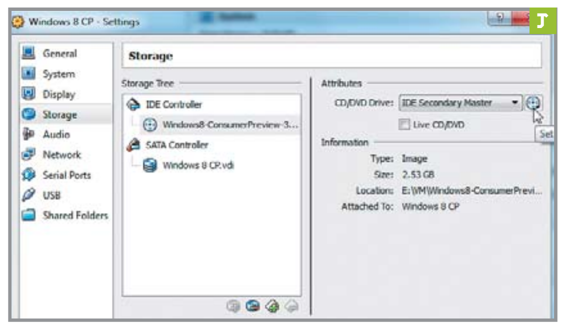
» The next screen enables you to define how much memory your virtual operating system should have. Windows 8 has a minimum memory requirement of 1GB for the 32-bit version but we recommend going for 2048MB unless your physical machine is a bit strapped for RAM. Once that's done, click Next.



2 CREATE YOUR VIRTUAL DRIVES The next step enables you to define the virtual drive for your installation. Go with the default setting to create a new virtual hard disk. On the next screen, leave the type as a VDI Drive Image—VirtualBox's own file format. It's fine to leave this virtual drive as dynamically allocated, as well.

» Define where you want your virtual disk to reside and change the initial drive size if you feel the need, although the default 20GB default size should be fine. Our Windows 8 installation sat at 7GB. Check that the summary is correct and when you're ready, hit the Create button.

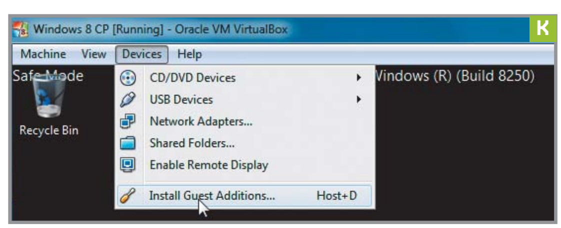
» Right-click Windows 8 and select Settings from the drop-down list. Click on Storage, then click the CD icon under IDE Controller. Click the CD icon to the right of the controller to locate your Windows 8 ISO (**image J**) and select "Choose a virtual CD/DVD disk file." Point it at the Windows 8 ISO you downloaded and click Open.



3 INSTALL WINDOWS 8 You're now set to install Windows 8 on your virtual machine. Just make sure the virtual PC is highlighted and then hit the Start button. The installation of Windows 8 is fairly straightforward—just be certain you pick a custom installation. Complete the installation and log into your account.

» Installing Guest Additions is a little trickier, as you need to install them in Safe Mode. Go to the desktop view, then hit Windows key + R and launch MSConfig. Click the Boot tab, check the Safe Boot and Base Video options, and then OK the changes, choosing to reboot into Safe Mode.

» Install the Guest Additions from the VirtualBox Devices menu (**image K**), enabling full 3D support. Don't reboot. Clear Safe Boot and Base Video in MSConfig, then power off the VM. Increase video memory to 128MB in the Display settings for the VM and enable 3D and 2D acceleration. Launch the VM and you're done.



BUILD IT

GORDON MAH UNG **DEPUTY EDITOR**



Who Says You Can't Build an All-in-One?

This month we tackle a DIY AiO

LENGTH OF TIME: **1.5 HOURS** | LEVEL OF DIFFICULTY: **INTERMEDIATE TO ADVANCED**



THE MISSION The all-in-one PC is predicted to be one of the hottest PC form factors over the next few years. That's great for Joe 12-Pack, but for an enthusiast, an AiO is pretty much as monolithic as you can get. Sure, you might be able to add RAM or swap the HDD, but that's usually the extent of the average AiO's upgradeability.

Enter Intel's new push for the DIY AiO, the first serious attempt at building a standard around this practice. All-in-one bare-bones kits have likely been available before, but Intel's backing formalizes it as a real DIY category. The big change is the Thin Mini-ITX, which specifies far slimmer mobo profiles than regular Mini ITX, as well as fixing a spot where the CPU can be installed. The fixed CPU location enables standard heat pipe–type cooling solutions as an option, whereas Mini ITX allowed vendors to put the CPU anywhere on the board.

To get our feet wet, we decided to build a nicely outfitted AiO to see how it would compare spec-wise to a prebuilt peer. The result? You'll have to read to the end, but we'll be a clock tease and say that a DIY AiO might be just the way to go.

CHOOSING THE HARDWARE

THE FIRST STEP of building an AiO is finding the chassis. Since Intel has been the main driver behind a standard, a good place to start is at http://intel.ly/T1TZPa. The DIY site has numerous resources for builders. We recommend that you start with the Design Component Catalog (http://intel.ly/UxUKPT) as well as the Compatibility Matrix (http://intel.ly/VzcHfv). Remember, the standard is evolving and we're not at the point of desktops, where 98 percent of hardware is compatible. For example, some of the AiO models use proprietary coolers while others can use the standard Intel part. AiO units that don't use the standard Intel heat pipe should ship with their own. Also keep in mind the thermal constraints of an AiO before you buy the parts.

Our build started with a Loop L5 LP-2150 chassis. The chassis features a 21.5-inch panel and normally comes without the cooler and power brick for about $265. We did find some sites offering it packaged with the Intel cooler and a power brick though, for a small savings. The board we used is an Intel DH61AG. It supports an external power brick–type connector and up to a 65-watt TDP desktop processor. For our build, we tapped the quad-core 3.1GHz Core i5-3570S chip, which is nearly the same as the Core i7-3770S save for the Hyper-Threading. For storage, the board supports Mini PCIe SSDs and standard 2.5-inch drives. For our build, we opted for an Intel 240GB 335 Series SSD. Finally, we went with a pair of Patriot 4GB SO-DIMMs.

INGREDIENTS

	PART	URL	PRICE
Chassis	Loop L5 LP-2150	www.loopint.com	**$265**
CPU	Core i5-3570S	www.intel.com	**$205**
RAM	8GB Patriot DDR3/1333	www.patriotmemory.com	**$38**
Motherboard	Intel DH61AG	www.intel.com	**$120**
Cooler	Intel HTS1155LP	www.intel.com	**$27**
PSU	FSP 150-ABAN1	www.fspgroupusa.com	**$48**
Wi-Fi	Intel 62230AN. HMWG Wi-Fi card	www.intel.com	**$24**
SSD	Intel 240GB 335 SSD	www.intel.com	**$200**
ODD	LG 12.7m GT60N 8x DVD+R combo drive	www.lg.com	**$28**
OS	Windows 7 Home Premium 64-bit	www.microsoft.com	**$99**
Total			**$1,054**

1 PREPARE THE CHASSIS

TO OPEN THE LOOP L5, lay it facedown on a clean, non-scratch surface and remove the five screws on back. Now, with the opening for the I/O shield facing you, gently push the tip of your screwdriver on the metal next to the exhaust vent while carefully pulling up on the chassis with your fingers (**image A**) until the back pops off just a bit. Then, carefully pry off the back, starting at the USB ports and headphone ports (**image B**). You'll use this same process to access the guts of the AiO for future upgrades.





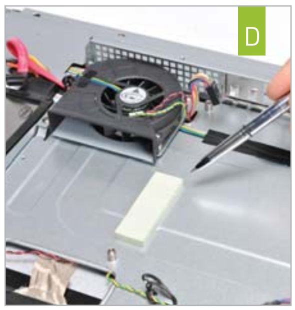
2 INSTALL DRIVES, CPU, AND RAM

WE'LL SKIP THE usual illustration of mounting the optical drive and SSD/HDD in the caddies and screwing them down, as the process is well known to most *Maximum PC* readers, but you can go ahead and do this now. (For new builders, Intel provides thorough video instructions for building a system in the Loop at http://intel.ly/TPWoyQ). Likewise, you've seen us install RAM and the CPU dozens of times; now is a good time to do that, as well. With the board out, you should also slot the Wi-Fi card into the Mini PCIe slot nearest the PCIe slot. Then, install the I/O shield.

3 INSTALL THE BACKPLATE

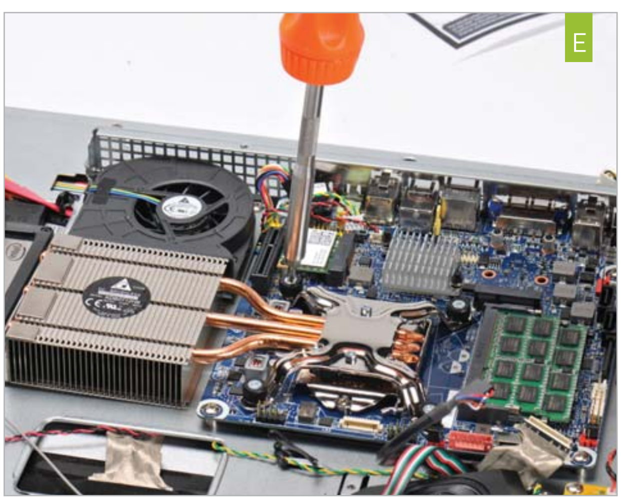
TO USE THE STOCK Intel thermal cooler, you'll need to install the backplate that comes with the kit. It sticks on with an adhesive pad (**image C**). The chassis should also have come with a thick thermal pad that gets mounted to the back of the motherboard, under the voltage regulation modules, or, if you can aim properly, to the chassis itself (**image D**). It mounts using an adhesive, so choose wisely. Now, mount the motherboard and screw it in place. As always, pay special attention to how the openings in the I/O shield line up with the motherboard before you screw it down (i.e., make sure the metal fingers coming off the I/O shield don't jam into the ports.)





4 INSTALL THE COOLER

WITH THE MOTHERBOARD in place, it's time to screw the cooler in place. The cooler should have an Intel thermal pad in place. If yours doesn't, or you are mounting it for a second time, add a small bit of thermal paste to the CPU and spread it out with a plastic bag across the surface of the heat spreader. Use the four screws to mount the cooler to the backplate (**image E**), and also screw down the two screws at the end of the heat pipe.



5 PUSH ASIDE THE SPEAKER

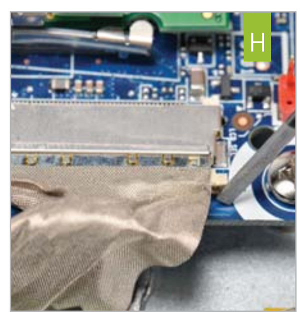
IT'S PRETTY tight in the AiO, so for removing or installing cables, you'll have to remove or simply move the speaker on the left side of the machine. Just undo one screw and move the speaker out of the way (**image F**).



6 PLUG IN THE PANEL

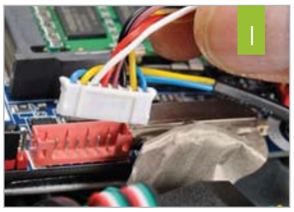
THE PANEL uses a delicate internal LVDS connector. While at first glance it appears to go in either way, the connector is keyed (**image G**). Carefully insert the cable into the LVDS port and then use a small object, such as a flat-head screwdriver, to carefully push it into place by alternatively nudging on each side of the connector while holding one side with your finger (**image H**). Once it's in place, don't ever remove the LVDS connector by tugging on the ribbon cable. If you have to remove it, use a small flat-head screwdriver to slowly nudge it out from the sides.





7 PLUG IN THE INVERTER

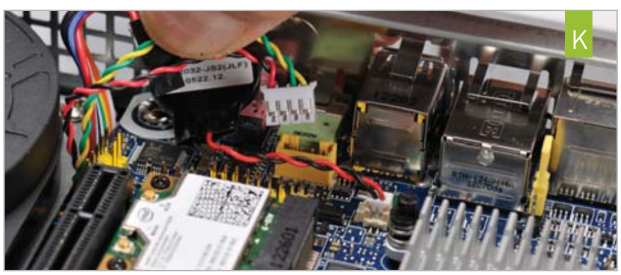
UNLIKE A DESKTOP monitor, which is powered by its own power brick or internal AC/DC device, the AiO needs to be powered from the motherboard. To do that you need to plug the 7-pin connector into the red header next to the LVDS connector (**image I**). This is also keyed to only fit in one way and should snap into place. Once that's done, follow the cable out to the end where you should find another connector. This gets plugged into the inverter board, which is the small orange, rectangular PCB to the left of the speaker (**image J**).





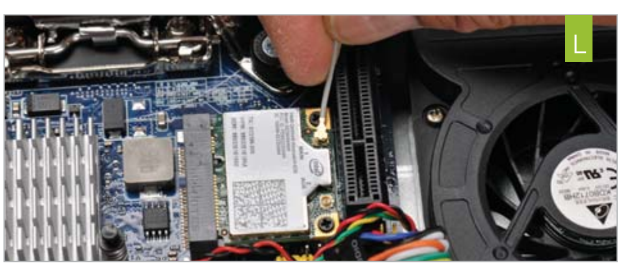
8 BRING THE NOISE

AGAIN, EVERYTHING in the AiO uses internal headers rather than external ports. If you want to use the AiO's internal speakers, you'll need to plug them in using the 4-pin header located near the Wi-Fi card and CMOS battery (**image K**). It's keyed to only fit in one direction.



9 CONNECT WI-FI

SOME AIO units come with multiple antennas, but Loop chose a single antenna for this chassis. We won't debate the wisdom of a single antenna, but it can create some confusion for newbs. Just look for the small gray antenna lead and plug it into the port labeled "Main 1" on the Wi-Fi card. It should snap into the socket with light pressure (**image L**).



10 SET THE VOLTAGE

YOU NEED TO configure the motherboard's headers for the correct voltage. First, check the 3-pin header next to the "FPD Power" inverter header that you plugged in earlier. By default, it should be set to pins 2 and 3, or 19 volts, which is correct for the Loop (**image M**). You'll want to check the manuals for your AiO and your motherboard, as setting the voltage incorrectly can damage the inverter. You also need to set a secondary inverter header to the correct voltage. This header is located near the front-panel connector and should be set to pins 4 and 6, for 5 volts (**image N**). This is the default position for the Intel motherboard and the correct voltage for the Loop.



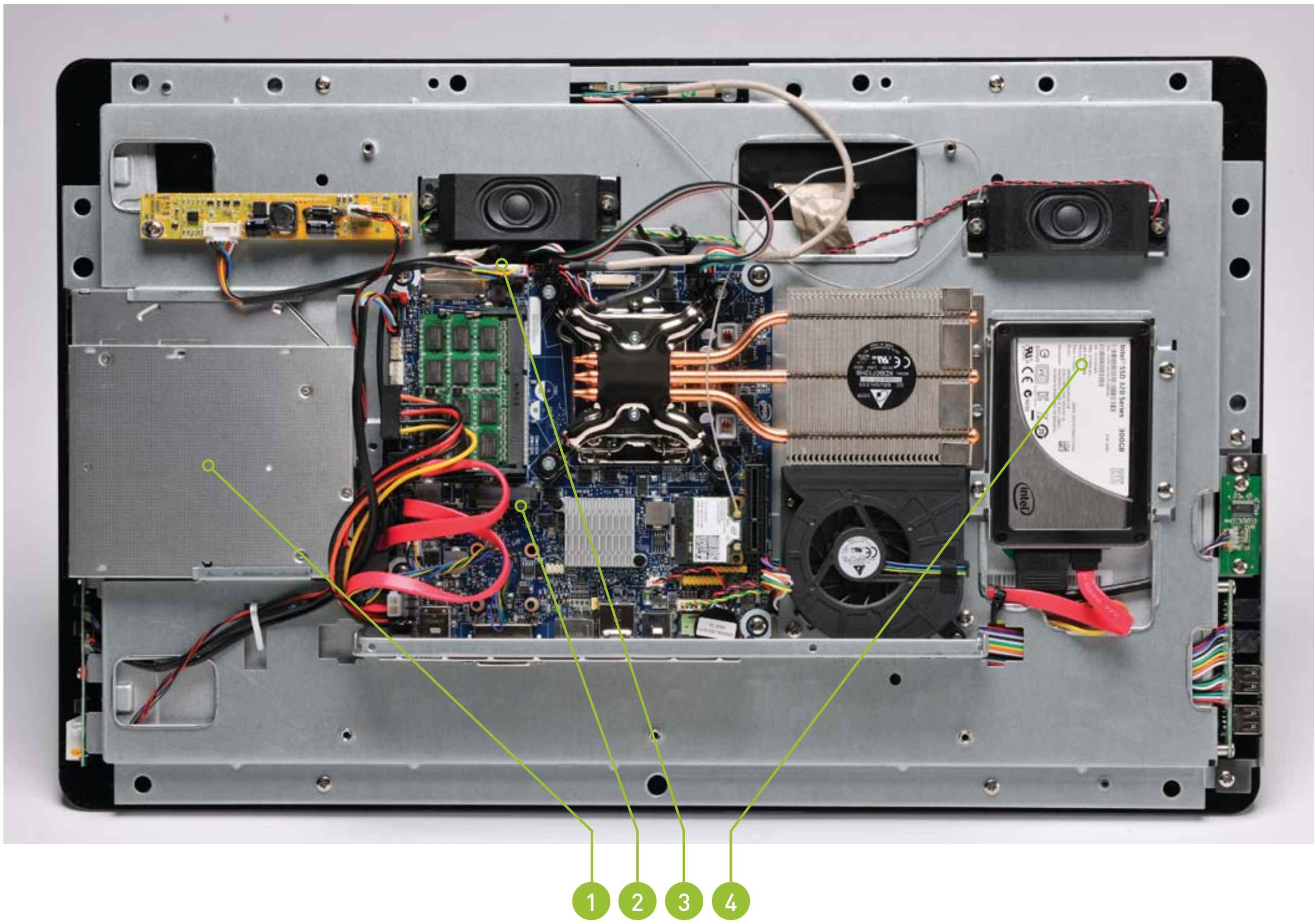


11 CONNECT FINAL PLUGS AND BUTTON UP

YOU'LL ALSO need to plug in the three USB headers as well as power and data cables for the optical drive and SSD, and you need to plug the SATA power cable into the motherboard. All that needs to be done now is to attach the back cover (while you plug the cover's auxiliary fan into an open fan header) and attach the stand. Now, just plug in your power brick and fire her up!

12 WELL, ALMOST...

INTEL'S MOTHERBOARD comes in an older rev, the G23736-503, and a newer rev, the G23736-504. If your board is a 504 or up, drive on. If it's older, you'll need to update the BIOS because the older board defaults to external graphics rather than the LVDS connector. No worries, you can update the board by just dropping the latest BIOS from the Intel website in the root of a USB key, removing the jumper from the BIOS_CFG header, and booting the machine. The board should automatically update after two minutes. Once the rig's blue system LED stops flashing, you can power down, replace the BIOS_CFG header, and move on. Even if you have the newer board, there is one setting you need to change. Go into the BIOS and then into the Video settings, and in the setting for All-in-One Chassis, set it to the chassis in use. In this case, it's the LP-2150. It's recommended that you then lock the settings so they can't be changed without going into maintenance mode.



1. Unlike most AiO units from the big boys, the DIY AiOs are familiar ground to builders.

2. The Thin Micro-ITX Intel board runs off a power brick and has a fixed CPU location.

3. You'll need to jumper two sets of headers to match the voltage for your AiO's panel.

4. The 300GB 320 Series SSD pictured here was eventually shelved in favor of a more economical 240GB 335 Series Intel SSD.

DIY AIO SHOWS A LOT OF PROMISE

BUILDING THE average desktop PC has long been a labor of love. Sure, in the old days you could save a serious chunk of change when you built your own rig, but these days it's pretty hard to get a better price than a large or even medium OEM that buys parts by the container-full. That's apparently not the case with all-in-ones, where it's possible for builders to have a price edge. Lenovo, for example, offers a 20-inch AiO with the same CPU, 180GB SSD, and 4GB of RAM for about the same price as our Loop build. Granted, some OEMs offer a feature not available to this platform—a discrete GPU. That's actually one of the holes we see in the current push for a DIY platform. Why no GPU provision? In the past, graphics vendors haven't been the greatest at sticking to specs, so that could be the reason, but we think a unified AiO graphics spec is necessary if this category is really going to take off.

As to how our AiO performed—not bad. Our zero-point AiO is an Asus ET2701 INKI-B046C with a Core i7-3770S and GeForce GT 640M. Naturally, the $1,500 Asus, with its 27-inch panel, pricier CPU, and discrete graphics outshines our Loop build, but it's a good reference for what our DIY AiO can do. Clearly, that extra $400 on the zero-point gets you more performance. Our DIY AiO performed respectably though, except in gaming. Intel HD4000 graphics are probably best suited for Portal 2–level and lower gaming. For today's integrated graphics, Metro 2033 is way beyond its pay grade.

Overall, we're pretty happy with the brave new world of DIY AiOs. Yes, it has some maturing to do, but giving enthusiasts the ability to customize an AiO to their own needs (or a parent's needs) is a pretty strong argument for doing it yourself.

BENCHMARKS

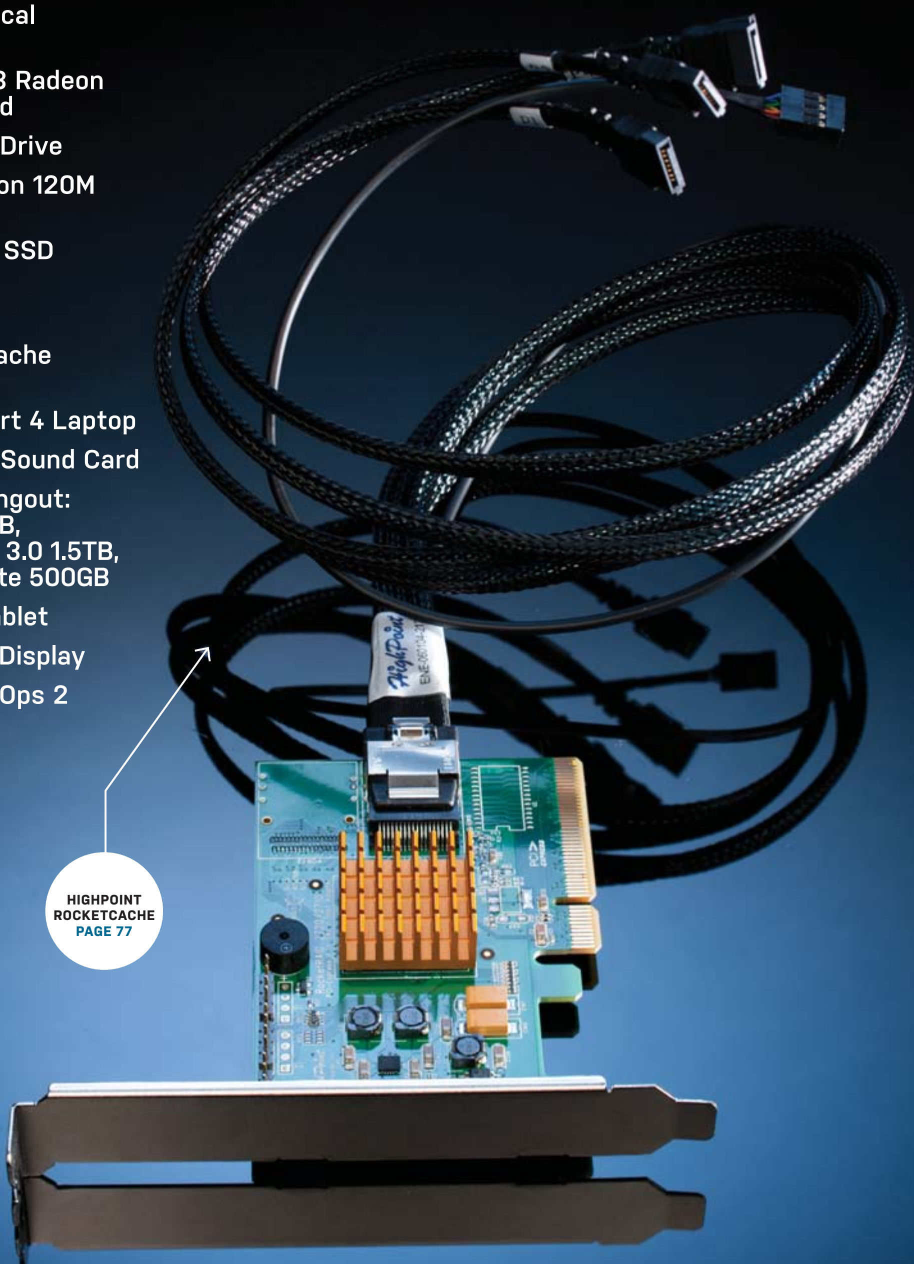
	Loop L5	Asus ET2701 INKI-B046C
3DMark 11	P449	**P1,937**
Metro 2033 (fps)	10.9	**29**
Adobe Premiere Pro CS3 (sec)	857	**404**
MainConcept (sec)	985	**919**
ProShow Producer 3.0 (sec)	591	**486**

Best scores are bolded. Our zero-point AiO features a Core i7-3770S, 8GB of DDR3/1600, a GeForce GT 640M, and a 2TB 7,200rpm HDD. Metro 2033 is run at 1280x720, medium quality, DX10 mode, with 4x AA and 4x MSAA.

REVIEWS

TESTED. REVIEWED. VERDICTIZED.

INSIDE



HIGHPOINT ROCKETCACHE PAGE 77

Geekbox Ego Maniacal

A matte-black benchmark bruiser

GEEKBOX'S EGO MANIACAL system pays homage to *Maximum PC*'s Dream Machine—but probably not the one you're thinking of.

Sure, last year's Dream Machine featured the same Silverstone TJ11 chassis as the Geekbox Ego Maniacal, but we're told that the actual inspiration for this custom-built box was 2002's Dream Machine, which was painted to match a classic BMW 2002 Turbo. Except Geekbox has updated its tribute to the car by nodding its head to the more current special edition BMW M3 in "frozen black."

The Ego might owe its inspiration to that Dream Machine of old, but its internals are a closer match with 2012's DM. Full details of the Ego's specs are down below, but the highlights include Intel's new king, the 3.5GHz Core i7-3970X, a pair of liquid-cooled GeForce GTX 690 cards, two 240GB Corsair Neutron GTX SSDs, 32GB of Corsair DDR3/1866, and a 1,200W Corsair AX1200i PSU. The most impressive part of the Ego may be its liquid cooling, which uses both a quad-rad *and* dual-rad to keep the parts cool—that includes the voltage regulation modules on the Asus Republic of Gamer board.

That's probably a good idea, too, because the Ego pushes the new 3.5GHz Core i7-3970X to a very stable 4.8GHz. That's about 1GHz further than our zero-point's overclocked six-core, and with its 25 percent higher clocks, the Ego offers that much more of a performance edge. In fact, the six-core Ego gave our zero-point—which is certainly no slouch in specs—a pretty good pummeling in every single benchmark. What about something a bit beefier, such as DM2012?

Between the two, it was a classic battle of cores vs. frequency, with DM2012 sporting eight cores at 3.1GHz vs. the Ego's six cores at 4.8GHz. In the apps that can't exploit all the cores of the DM2012 (or even the Ego, for that matter), clock speeds won out, with the Ego pulling up a score 27 percent faster in Stitch.Efx 2.0 and 30 percent faster in ProShow Producer 5.0. When you get into the heavily multithreaded tasks, however, the cores-vs.-frequency argument gets interesting. The Ego was faster than the DM2012 in Premiere Pro CS 5.0 by about 4 percent and about 1 percent faster in the x264 HD 5.0 benchmark. That's a victory for frequency, but at the same time, we're talking about a 1.7GHz difference between the six-core and eight-core chips, so the core crowd can claim a moral victory. We also have to acknowledge that the Ego set benchmark records in all six official benchmarks we run. Although not everything was by a large margin, it's still one hell of an accomplishment for one single system to sweep all six.

The real magic of the Ego is in the phenomenal amount of detail paid to its construction. Geekbox says it spends no less than 40 hours to build its high-end custom machines and it shows, from the washers on the case-door screws that prevent scratches to the paint, to the custom-length cables that are each sleeved and heat-shrunk by hand (nary a zip tie is present). There are other loving details about the case that we just don't have the space for here, but we must admit we were a bit let down by the decals. Rather than covering them with a clear coat, Geekbox just stuck them atop the matte-black paint job, which is decidedly less impressive—you can feel the decals' edges when you slide your hand over them.

It's also odd for the company not to include mass storage, but Geekbox says that's more of lifestyle statement. In your garage, you'll have your M3 for weekends and your minivan for weekdays, so why clutter the M3 with baby seats? We understand that rational but we don't buy it, because while this machine is fast, it's also expensive at $7,995. Yeah, that's a deal next to DM2012's $11,055 but one HDD couldn't hurt.

Despite the interesting storage configuration and heart-stopping price, we can't argue with the raw performance and attention to detail that might take custom rigs to the next level.

–GORDON MAH UNG

VERDICT 9 KICK ASS!

Geekbox Ego Maniacal

➕ **SUPER EGO** Benchmark breaker; superb attention to detail.

➖ **ID** Really, not even a single HDD?

$7,995, www.geekbox.com

BENCHMARKS

	ZERO-POINT	
Premiere Pro CS6 (sec)	2,000	1,612
Stitch.Efx 2.0 (sec)	831	709
ProShow Producer 5.0 (sec)	1,446	1,194
x264 HD 5.0 (fps)	21.1	25.6
Batman: Arkham City (fps)	76	134
3DMark 11	5,847	12,090 (107%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard. We are running a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.

SPECIFICATIONS

Processor	Intel Core i7-3970X@4.8Ghz
Mobo	Asus Rampage IV Extreme
RAM	32GB DDR3/1866
Video Card	Two EVGA GeForce 690 in SLI
Sound Card	Onboard
Storage	Two 240GB Corsair Neutron GTX SSDs in RAID 0
Optical	None
Case/PSU	Silverstone TJ11/ Corsair AX1200i



Geekbox individually sizes and sleeves the cables for each PC it builds.



The Devil 13 is so enormous it comes with its own vertical support stand.

PowerColor Devil 13 Radeon HD 7990

Holy sh*t

THERE ARE SEVERAL ways to reconcile why PowerColor named its dual Radeon HD 7970 monstrosity the Devil 13. On the one hand, the card probably got its name from the fact that it's an unholy abomination of GPU horsepower, combining two already-hot-running GPUs into one massive, inferno-producing card that gets as hot as Hades. On the other hand, perhaps its sinister moniker is due to the fact that this video card shouldn't really exist, as AMD never produced one (even though we all expected it last summer). PowerColor must have said, "Screw it, we'll make it ourselves!" And thus the Card of Darkness was born; a rare, one-off, fire-breathing $1,000 concoction that flies in the face of power, heat, and cost concerns. And since this is *Maximum PC*, all we can say is, "Hell yes."

PowerColor didn't just give this card a devilish name and leave it at that; oh no, it went whole devil-hog. It comes in a black box with a simulated red-wax seal on the top that must be "broken" to get at the contents (even though it's just a sticker, it looks cool). In addition to the video card, you also get a slew of adapter cables, a PowerJack stand to support the card in its PCIe slot, and—get this—a $100 set of adjustable Wiha tools (hex heads and screwdrivers). These are among the best tools ever made for PC builders and their inclusion shows how far PowerColor has gone to make this card the ultimate investment for your rig.

The card itself is as decadent as you'd imagine it would be, boasting a triple-fan cooler that blows warm air away from the oversize heatsinks, each of which is fed by a copper base and five copper heat pipes. The card requires three 8-pin PCIe power connectors and an 850W PSU minimum, but you wouldn't buy this card if you didn't already have a monstrous power supply. It features 6GB of GDDR5 memory connected via dual 384-bit memory buses, and includes single- and dual-link DVI, two Mini DisplayPort, and one HDMI output connector.

In testing, the Devil made quite an impression on us, both with its gaming performance and the amount of noise and heat it produced. DepEd Gordon Mah Ung put it best: "It's a nice card to run in the wintertime," as it gets extremely hot, but we experienced no heat-related instability during testing even though temps hovered around 78 C under full load. The card is loud, though. At one point, Gordon asked us to stop a benchmark as he was trying to talk on the phone—and his desk is roughly 20 feet away from the testing station. The card also has a red button on the I/O area that engages its Turbo mode (core clock boosts from 925MHz to 1,000MHz) and though we saw some impressive performance gains in some titles (up to 10fps gained) the extra noise created by the overclocked card was simply unbearable.

Noise aside, this is a very powerful video card, and its performance was extremely close to what you'd achieve with a HD 7970 CrossFireX configuration in almost every benchmark. In general, though, we saw the HD 7990 run a little slower than a CrossFireX setup, and it was noticeably slower than its arch nemesis, the GeForce GTX 690, which runs cooler, quieter, and is about half the size of the HD 7990. The only game that gave us issues was Batman: Arkham City, which does not support CrossFire. In every other game, performance was very good, but not as good as the Nvidia cards it competes against.

In the end, this card kicks a lot of ass and is by far the fastest single video card currently available for the AMD faithful. But since the Nvidia cards are not only faster but quieter and cooler, we're at a loss as to who would actually spend money on this GPU. –**JOSH NOREM**



BENCHMARKS

	PowerColor Radeon HD 7990	AMD Radeon HD 7970 CrossFireX	EVGA GeForce GTX 690	Nvidia GTX 680 SLI	AMD Radeon HD 7970
3DMark 2011 Perf	13,932	14,134	15,060	**15,804**	8,337
3DMark 2011 Extreme	5,416	5,473	5,877	**6,072**	2,839
3DMark Vantage Perf	43,743	44,711	43,707	**45,205**	32,845
Unigine Heaven 2.5 (fps)	54.9	56.4	58.6	**60.8**	28.7
Shogun 2 (fps)	**57.8**	55.13	54.2	38	25.7
Far Cry 2 / Long (fps)	182.6	187.4	**206.7**	187.9	132.7
Dirt 3 (fps)	**125.9**	125.2	116.1	124.5	70.5
Metro 2033 (fps)	31.6	32.3	**42**	29.5	28
STALKER: CoP DX11(fps)	74.7	**76.4**	67.2	66.1	38.7
Just Cause 2 (fps)	91	**93.5**	74.1	81.03	51
Batman: Arkham City (fps)	54	56	**105**	104	60

Best scores are bolded. Our test bed is a 3.33GHz Core i7-3960X Extreme Edition in an Asus P9X79 motherboard with 16GB of DDR3/1600 and a Thermaltake Toughpower Grand 1050 PSU. The OS is 64-bit Windows 7 Ultimate. All games are run at 25600x1600 with 4x AA and all settings maxed out, except for the 3DMark tests, and Shogun 2, which is run at 1080p High settings.

VERDICT 7

PowerColor Devil 13 Radeon HD 7990

+ WIHA Best GPU bundle ever; almost as fast as two cards in SLI; looks badass.

– SNAP-ON Loud; doubles as a space heater; expensive.

$1,000, www.powercolor.com

PowerColor Devil 13 Radeon HD 7990

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PowerColor didn't just give this card a devilish name and leave it at that; oh no, it went whole devil-hog. It comes in a black box with a simulated red-wax seal on the top that must be "broken" to get at the contents (even though it's just a sticker, it looks cool). In addition to the video card, you also get a slew of adapter cables, a PowerJack stand to support the card in its PCIe slot, and—get this—a $100 set of adjustable Wiha tools (hex heads and screwdrivers). These are among the best tools ever made for PC builders and their inclusion shows how far PowerColor has gone to make this card the ultimate investment for your rig.

The card itself is as decadent as you'd imagine it would be, boasting a triple-fan cooler that blows warm air away from the oversize heatsinks, each of which is fed by a copper base and five copper heat pipes. The card requires three 8-pin PCIe power connectors and an 850W PSU minimum, but you wouldn't buy this card if you didn't already have a monstrous power supply. It features 6GB of GDDR5 memory connected via dual 384-bit memory buses, and includes single- and dual-link DVI, two Mini DisplayPort, and one HDMI output connector.

In testing, the Devil made quite an impression on us, both with its gaming performance and the amount of noise and heat it produced. DepEd Gordon Mah Ung put it best: "It's a nice card to run in the wintertime," as it gets extremely hot, but we experienced no heat-related instability during testing even though temps hovered around 78 C under full load. The card is loud, though. At one point, Gordon asked us to stop a benchmark as he was trying to talk on the phone—and his desk is roughly 20 feet away from the testing station. The card also has a red button on the I/O area that engages its Turbo mode (core clock boosts from 925MHz to 1,000MHz) and though we saw some impressive performance gains in some titles (up to 10fps gained) the extra noise created by the overclocked card was simply unbearable.

Noise aside, this is a very powerful video card, and its performance was extremely close to what you'd achieve with a HD 7970 CrossFireX configuration in almost every benchmark. In general, though, we saw the HD 7990 run a little slower than a CrossFireX setup, and it was noticeably slower than its arch nemesis, the GeForce GTX 690, which runs cooler, quieter, and is about half the size of the HD 7990. The only game that gave us issues was Batman: Arkham City, which does not support CrossFire. In every other game, performance was very good, but not as good as the Nvidia cards it competes against.

In the end, this card kicks a lot of ass and is by far the fastest single video card currently available for the AMD faithful. But since the Nvidia cards are not only faster but quieter and cooler, we're at a loss as to who would actually spend money on this GPU. –JOSH NOREM



BENCHMARKS

	PowerColor Radeon HD 7990	AMD Radeon HD 7970 CrossFireX	EVGA GeForce GTX 690	Nvidia GTX 680 SLI	AMD Radeon HD 7970
3DMark 2011 Perf	13,932	14,134	15,060	**15,804**	8,337
3DMark 2011 Extreme	5,416	5,473	5,877	**6,072**	2,839
3DMark Vantage Perf	43,743	44,711	43,707	**45,205**	32,845
Unigine Heaven 2.5 (fps)	54.9	56.4	58.6	**60.8**	28.7
Shogun 2 (fps)	**57.8**	55.13	54.2	38	25.7
Far Cry 2 / Long (fps)	182.6	187.4	**206.7**	187.9	132.7
Dirt 3 (fps)	**125.9**	125.2	116.1	124.5	70.5
Metro 2033 (fps)	31.6	32.3	**42**	29.5	28
STALKER: CoP DX11(fps)	74.7	**76.4**	67.2	66.1	38.7
Just Cause 2 (fps)	91	**93.5**	74.1	81.03	51
Batman: Arkham City (fps)	54	56	**105**	104	60

Best scores are bolded. Our test bed is a 3.33GHz Core i7-3960X Extreme Edition in an Asus P9X79 motherboard with 16GB of DDR3/1600 and a Thermaltake Toughpower Grand 1050 PSU. The OS is 64-bit Windows 7 Ultimate. All games are run at 25600x1600 with 4x AA and all settings maxed out, except for the 3DMark tests, and Shogun 2, which is run at 1080p High settings.

VERDICT 7

PowerColor Devil 13 Radeon HD 7990

+ WIHA Best GPU bundle ever; almost as fast as two cards in SLI; looks badass.

− SNAP-ON Loud; doubles as a space heater; expensive.

$1,000, www.powercolor.com



Despite its consumer branding, the Black drive comes with an enterprise-level, 5-year warranty.

WD 4TB Black

The one to get if you need 4TB in a single drive

AS CONSUMERS, we have only two options when it comes to 7,200rpm 4TB hard drives: the Hitachi 7K4000 (Verdict 8, Holiday 2012) and this bad boy right here—the WD 4TB Black drive. Seagate does not currently offer a 7,200rpm 4TB Barracuda, but it does offer a 3TB version. For the uninitiated, WD classifies its drive by color, and Black stands for "high performance," which means this is exactly the drive we've been waiting for WD to deliver, as speed is our primary concern with PC hardware. Its specs show all the signs of a high-performance drive, too, as it offers a 7,200rpm spindle speed, 4MB of cache, dual-arm actuators to increase precision when positioning the heads, and a five-platter design. It even offers the same 1.2-million-hour MTBF (Mean Time Between Failure) and 5-year warranty as the enterprise-level RE drive, which is outstanding for a consumer-level drive.

For testing, we compared the Black drive to its 4TB companions and also brought in the current price/performance champion, the Seagate 3TB Barracuda. When it comes to the 4TB 7,200rpm drives, you can pretty much throw a blanket over all of them when it comes to sequential read and write speeds, as they are all extremely close.

In read speeds, the Black drive hit 127.9MB/s, the Hitachi drive upped it to 132.7MB/s, but the fastest drive was the Seagate 3TB at 155.8MB/s, thanks to its high-density terabyte-per-platter design. The Seagate was also fastest in sequential write speeds at 155MB/s. We did see some variation in our Premiere test though, which writes a 20GB raw AVI file to the target drive. The Hitachi 7K4000 was 16 seconds faster than the WD Black, and also faster than the WD RE drive, making it a clear favorite. In the PCMark Vantage test, the Seagate 3TB reigned supreme along with the WD RE drive, with the rest of the contenders scoring relatively low comparatively.

Finally, we considered price, as well, since for most people that would be the deciding factor in a drive's desirability. Interestingly, there's a large disparity here, making our final choice an easy one. The WD RE drive and the Hitachi 7K4000 are roughly $500 on Newegg as we go to press, with the WD Black selling for just $400. The Seagate 3TB Barracuda, however, is just $140. The WD Black 4TB gets our nod then for best 4TB drive for the money, but the best *overall* drive for the money is still the Seagate 3TB. –JOSH NOREM

BENCHMARKS

	WD 4TB Black	WD 4TB RE	Hitachi 4TB 7K4000	Hitachi Deskstar 5K4000	Seagate Barracuda 3TB
HDTune 4					
Avg. Read (MB/s)	127.9	132.8	132.7	108.3	**155.8**
Random-Access Read (ms)	13.6	**12.5**	15.9	19.9	14.9
Burst Read (MB/s)	213.2	275.5	307.9	**378.3**	325.7
Avg. Write (MB/s)	129.9	131.9	131.1	105.6	**155**
Random-Access Write (ms)	13.2	**12.5**	15.9	18.5	14.9
Burst Write (MB/s)	**336.2**	291.6	317.3	335	335.5
Premiere Pro CS3 (sec)	269	259	**253**	267	263
PCMark Vantage	6,196	6,664	6,125	6,135	**6,766**

Best scores are bolded. All drives tested on our hard drive test bench: a stock-clocked Intel Core i5-2500K CPU on an Intel DZ77GA-70K motherboard with 4GB DDR3, running Windows 7 Professional 64-bit. All tests performed using native Intel 6Gb/s SATA chipset with IRST version 10.1 drivers.

VERDICT 8

WD 4TB Black

+ PURRFECT Spacious; lowest-priced 4TB drive yet.

– CATASTROPHE Only average performance; can't beat value of 3TB drives.

$400 (street), www.wd.com



Cooler Master says that the Teflon tubing on the 120M minimizes water evaporation.

Cooler Master Seidon 120M

Cooler Master Seidon 120M

WITH THE VAST majority of closed-loop water-cooling kits based on either Asetek or CoolIt designs, Cooler Master's in-house-designed Seidon 120M easily stands out from the crowd. At just $70, it's one of the more affordable kits we've seen, too, and though it's not the answer to our cooling prayers, it proves you don't need to spend a lot of money to get a decent water cooler.

Like its competitors, the kit includes all the usual ingredients: a prefilled aluminum radiator with a 12cm fan, a copper contact plate, two tubes to shuttle coolant back and forth, and a pump built directly into the CPU water block. Though the Seidon 120M looks a lot like Asetek-designed coolers, its water block/pump apparatus is noticeably more low-profile than others we've tested.

Installing the water cooler was, for the most part, a drama-free affair. The 120M features a universal backplate with pre-attached screws (for use with sockets other than LGA2011). Even the retention clips include pre-attached and easily adjustable screws. We ran into a little trouble differentiating between the AMD and Intel clips, and it would have been nice if they were labeled (either the clips themselves or the bags they came in), because the Intel and AMD parts look confusingly similar. Once we eyeballed the clips next to the sockets to figure out which was which, we had no trouble attaching the clips to the base of the water block and securing them to the backplate, and then mounting that on top of the CPU's heat spreader. Attaching the radiator to the chassis was also a walk in the park, as we used the included screws to mount the fan to the radiator and the radiator to our Level 10 GT chassis. The last step was to simply plug the power cable from the pump into the CPU header, and to connect the 12cm fan's PWM connector to a fan controller.

Once installed, the fan was very quiet with Q-Fan enabled in the BIOS, but under a heavy thermal load at 4.2GHz on our Core i7-3960X, it didn't perform much better than a Hyper 212 Evo air cooler. When we ran the system at full speed, however, cooling performance improved dramatically, running six degrees cooler under load but still 1 C hotter than the dual-fan Thermaltake Water2.0 Pro. To its credit though, the Seidon was quieter at full tilt than the Water2.0, which sounded like a wind tunnel.

Though the Seidon only comes with one 12cm fan, we added a second Thermaltake fan to test a push-pull configuration and saw a dramatic performance boost, putting it on par with the more-expensive Water2.0 Pro, but sadly its noise output was equally loud.

If you're looking for a super-cool and quiet water cooler, you're not going to find it with the Seidon 120M—it can be cool and quiet, just not at the same time. Cooler Master doesn't reinvent the water-cooling wheel with its Seidon 120M, but the cooler's affordable $70 price makes it a good value considering that its performance is very close to much more expensive competitors. –**JIMMY THANG**

VERDICT 8

Cooler Master Seidon 120M

➕ **ICE-COLD BEER** Affordable; easy installation.

➖ **ICE-COLD HANDS** Similar performance to an air-cooler when quiet, but loud when the fan's turned up.

$70, www.coolermaster.com

BENCHMARKS

	Cooler Master Seidon 120M (Performance mode)	Cooler Master Seidon 120M (Quiet mode)	Thermaltake Water2.0 Pro (Performance mode)	CM Hyper 212 EVO (Performance mode)	Cooler Master Seidon 120M (Performance mode with two fans)	Corsair H80 (Performance)
Ambient Air	21.6	22.2	21.2	23.8	23.7	23.2
Idle Temperature	30.7	36.4	32.2	36.2	31.8	34.9
Burn Temperature	68.3	73	66.6	74	67.5	**65.3**
Burn - Ambient	46.7	50.8	45.4	50.2	43.8	**42.1**

Best scores are bolded. All temperatures are in degrees Celsius. All tests performed using an Intel Core i7-3960X at 4.2GHz, on an Asus Sabertooth X79 motherboard in a Thermaltake Level 10 GT with stock fans set to High.

SPECIFICATIONS

Radiator Dimensions (H x D x W)	5.9 x 4.6 x 1.1 inches
Weight	1.5 lbs
Stock Fans	1x 12cm PWM
Socket Support	LGA775/1155/1156/1366/2011; AM2/AM3/AM3+/FM1
Additional Fan Support	One 12cm (screws not included)



The Vector is the first to use OCZ's very own Barefoot 3 controller, and the company has certainly done its homework on this one.

BENCHMARKS

	OCZ Vector	Corsair Neutron GTX	Samsung 840 Pro	OCZ Vertex 4	Intel Series 520	Crucial M4
Controller	Indilinx Barefoot 3	LAMD LM87800	Samsung MDX	Indilinx Everest 2	SandForce SF-2281	Marvell 9174
Capacity	256GB	240GB	256GB	256GB	240GB	256GB
Price	$270	$250	$270	$200	$250	$200
CrystalDiskMark						
Avg. Sustained Read (MB/s)	497.3	438.1	**517.7**	452.2	478.2	404.5
Avg. Sustained Write (MB/s)	496.8	472.4	**499.1**	400.3	245	257.3
AS SSD						
4KB Read (IOPS)	6,500	6,906	**6,917**	6,475	5,793	5,091
4KB Write (IOPS)	**17,758**	16,938	16,582	15,997	17,213	13,837
ATTO						
64KB File Read (MB/s)	**522.9**	486.3	514	425.3	510.2	260.2
64KB File Write (MB/s)	**541.5**	348.9	**542**	383.2	318.1	284.9
Iometer						
4KB Random Write (32QD)	80,015	**81,634**	61,931	28,206	81,624	56,087
PCMark Vantage x64	**74,005**	73,494	56,608	38,251	66,991	61,758

Best scores are bolded. Our current test bed is a 3.4GHz Core i5-3570K processor on an Asus P8Z77-V Premium motherboard running Windows 7 Professional 64-bit. All tests used onboard 6Gb/s SATA ports with latest Intel drivers.

OCZ Vector 256GB SSD

OCZ's new flagship SSD kicks serious ass

SAY HELLO TO WHAT most of us would have considered the new OCZ Vertex 5 SSD. That's right; this isn't some off-shoot, subpar asynchronous-NAND-using bargain-basement drive, but OCZ's new benchmark-busting flagship SSD, and the first to use the company's very own Indilinx Barefoot 3 controller and firmware rather than a modified Marvell or SandForce controller like OCZ's previous drives. Since the drive uses OCZ's own controller, the company ditched the Vertex branding and went with an all-new name, hence the Vector badge.

OCZ is claiming this drive is all-around fast, and can not only read and write like the dickens but also boasts extremely high IOPS performance *and* longevity, the latter of which is backed by an impressive 5-year warranty. The drive uses 25nm ONFI synchronous MLC NAND flash, feels extremely solid, and even looks pleasing to the eye with its radiused edges. It's also just 7mm thick, so it should fit into some Ultrabooks. It rides the SATA 6Gb/s interface, and supports Trim, garbage collection, SMART, and ECC error-correcting, and ships with a 3.5-inch bay adapter as well as a copy of Acronis drive-cloning software. Of course, all of these features and endurance don't come cheap, and the Vector is priced right at the tippy-top of the price range for 256GB SSDs, hovering next to the Samsung 840 Pro at $270.

In our tests, the Vector's performance was extremely impressive, running neck-and-neck with our returning champion, the Samsung 840 Pro, and also edging out the Corsair Neutron GTX in many benchmarks, making it one of the fastest SSDs we have ever tested. In our sequential read and write tests using CrystalDiskMark, the Vector was nicked at the line by the Samsung drive, but it was a tight race as the Vector sat right around 500MB/s for both read and write speeds, which is top-of-the-charts. In our ATTO 64K compressible-data test, the Vector basically saturated the SATA interface, burying the needle at a 522MB/s write speed and 514MB/s read speed—again, bringing it neck-and-neck with the Samsung 840 Pro. This was the only test where the Vector had a clear advantage over the Corsair Neutron GTX.

When it comes to low-depth 4K queues, the Vector ran slightly behind the Samsung drive in AS SSD, which is a "worst-case scenario" test that uses incompressible data and hits the drive with a small workload of four commands in a queue. This is designed to test an average desktop user's workload, and we saw it trailing the Samsung slightly in read speeds but dominating in write speeds. When we increased the workload to a 32-command queue in Iometer, the Vector took second place overall behind the Neutron GTX at 80K IOPS, both of which are substantially faster than the Samsung 840 Pro.

The Vector took top marks in our real-world PCMark Vantage test with a score of 74K, with the Neutron trailing by a smidgen at 73K and the Samsung 840 Pro back at 56K. All three drives are smokin'-fast, but the OCZ is the fastest we've seen yet. But let's make it clear: At this time, the SATA interface is clearly the impediment to increased performance of an SSD not plugged directly into a PCIe slot.

The upshot then is that the OCZ drive freaking rocks. It's one of the fastest SSDs we've ever tested and it performed impressively in every single test we ran. There's very little for us to complain about, which is rare. Of course, we can point to the high price, but that's in line with the Samsung 840 Pro's cost, so it's not totally outrageous. It seems that if you want this level of performance you've got to pay a premium for it. But also keep in mind that the Corsair Neutron GTX costs a bit less than both the OCZ Vector and the Samsung 840 Pro, and offers extremely comparable performance. That said, the Vector is a victor, and you have our clearance, Clarence, to use it in your rig. –**JOSH NOREM**

VERDICT 9 KICK ASS!

Vector 256GB SSD

+ **NAND FLASH** Extremely fast in every test; looks and feels high-quality; 5-year warranty.

− **MARDI GRAS FLASH** Expensive.

$270, www.ocztechnology.com



The Nomad 15's glossy surfaces give it a distinct look and prevent fingerprint smudges.

Maingear Nomad 15

Don't judge a gaming laptop by its cover

AFTER REVIEWING the iBuyPower CZ-17 last month and seeing it look nearly identical to our zero-point MSI GT60, we were hoping our next gaming laptop would be a fresh, new design. Unfortunately, Maingear's Nomad 15 apparently uses the same original design manufacturer (ODM) construction as those other two.

This isn't to say the 15.6-inch laptop is ugly. It's just that when you're paying $2,600 for a device, you'd like to get something that looks cool and original (see the Razer Blade laptop reviewed in the Holiday issue). The 14.9x10.2x1.7-inch chassis and nearly eight-pound body is roughly the same size/weight as the MSI GT60 and features the same geometric contours and cut-off corners. Its keyboard features the exact same faint, blue backlit-LED keyboard as the CZ-17.

To be fair, Maingear does add some small tweaks to the ODM design: The laptop cover comes in a wide variety of colors (we got ours in blue), the palm-rest area is textured with a pattern of small hexagons, and the body has a distinctly glossy coat that does a surprisingly good job of keeping fingerprints at bay. Another nice aspect of the laptop is its screen. The matte 1920x1080-resolution monitor does a great job of minimizing the annoying TN-shimmer commonplace on cheaper screens, and off-axis viewing is surprisingly good.

While the monitor is nice, it's what's under the hood that really shines. Our Nomad 15 came loaded with impressive specs: a 2.8GHz Intel Core i7-3840QM processor, 16GB of DDR3/1600, and a GeForce GTX 680M. It clearly beat the GT60 zero-point in nearly every one of our performance benchmarks. The closest our zero-point got to the Nomad 15 was in the CPU intensive tests (Stich, ProShow, and x264 HD 5.0), but even here the GT60 was still behind by at least 10 percent in all tests. In the GPU-intensive applications, Maingear's laptop really blew our zero-point out of the water. The Nomad 15's GeForce GTX 680M annihilated the GT60's GTX 670M by 210 percent in our STALKER benchmark. The gap only widened when we ran 3DMark 11, where Maingear's laptop slaughtered the GT60 by 242 percent. These tests only confirm that a 680M with its new 28nm Kepler architecture is that much more efficient than a 670M with its older Fermi design.

In our experiential gameplay tests, the Nomad 15 didn't break a sweat running Source-engine games like Dota 2 maxed-out—it had no problems staying above 70fps. We pressed on and installed Far Cry 3, a shooter that's known to make even the fastest desktop GPUs cry (pun intended). While the Nomad 15 didn't come close to maxing-out the graphically intensive game, it was able to stay consistently above 40fps on "high" settings at 1080p. Conversely, on the same settings, our zero-point couldn't even break 30fps.

Boot times on the Nomad 15 were also good. Armed with a pair of Crucial M4 128GB SSDs, the Nomad 15 booted to Windows in 24 seconds. Our SSD-less zero-point took more than twice as long. The only area where Maingear's offering fell behind the zero-point was in battery life but by just 10 percent in video playback. It appears that all that power has to take a toll somewhere.

When you're spending a premium for a gaming laptop, you might expect a unique, beautifully designed chassis. You're not getting that here. What you're paying for is brute-force performance, and what a beast of a performer this Nomad 15 is.

–JIMMY THANG

VERDICT 9

Maingear Nomad 15

➕ **NOMAD** Killer performance; nice monitor.

➖ **HERMIT** Unoriginal design; expensive.

$2,600, www.maingear.com

BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	1,092	917
ProShow Producer 5 (sec)	1,786	1,540
x264 HD 5.0 (fps)	12	13.4
STALKER: CoP (fps)	32.8	69.1 (210.7%)
3DMark 11 Perf	2,979	7,122 (242.1%)
Battery Life (min)	187	170 (-9.1%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

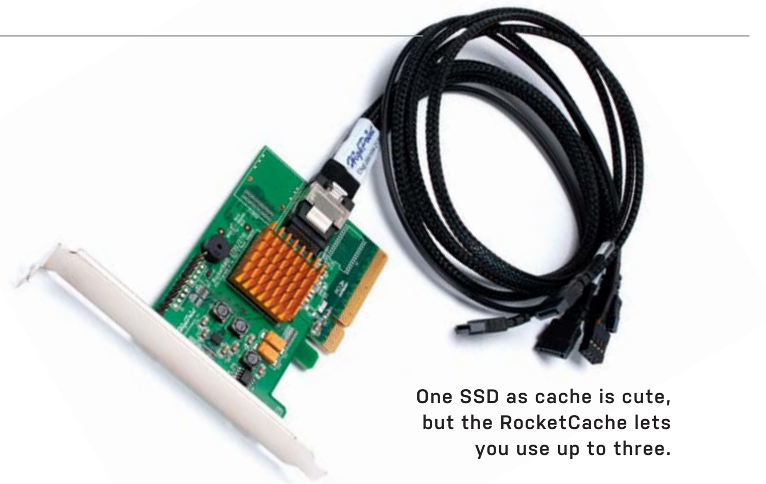
Our zero-point notebook is an MSI GT60 with a 2.3GHz Intel Core i7-3610QM, 12GB DDR3/1600, two 500GB Seagate 7,200rpm hard drives, a GeForce GTX 670M, and Windows 7 Home Premium 64-bit. STALKER: CoP tested at 1920x1080 with Ultra settings, Tessellation, and contact hardening.

SPECIFICATIONS

CPU	2.8GHz Intel Core i7-3840QM
RAM	16GB DDR3/1600
Chipset	Intel HM77
GPU	Nvidia GeForce GTX 680M 4GB GDDR5
Display	15.6-inch, 1920x1080 LED display (glossy)
Storage	2x 128GB SSDs; 750GB HDD
Optical Drive	8x DVD burner
Connectivity	Ethernet, VGA, HDMI, eSATA, all-in-one USB 2.0 flash card reader, 3x USB 3.0, 2x USB 2.0, audio in, audio out, headphone, mic, 2MP webcam, Bluetooth, 802.11n
Lap / Carry	7 lbs, 7.3 oz / 9 lbs, 10.6 oz

HighPoint RocketCache 3240x8

Takes SSD caching to a whole new level



One SSD as cache is cute, but the RocketCache lets you use up to three.

IT'S TOUGH to wrap your head around HighPoint's RocketCache, so we'll try to sum it up as being simply crazy performance, if you're willing to deal with the configuration hassles.

The RocketCache is a x8 PCIe 2.0 card that lets you connect up to four SATA devices to it via a Medusa-like cable with four SATA 6Gb/s connectors on it. The card lets you run two HDDs with two SSDs for caching, or—more crazy—one HDD with three SSDs for *insane* caching. That's not all. You can select between maximum performance, maximum performance with cache protection, RAID 1 with two hard drives and two SSDs for caching speed (maximum performance and protection), and maximum protection, which is RAID 1 with cache written to disks. One important note is that this device is not bootable, which is very unfortunate.

To test the RocketCache, we grabbed a WD 1TB Black drive, two OCZ Vertex 4 SSDs, and one Intel 335 Series SSD, and we ran all tests in Maximum Performance mode, which takes roughly 22GB from each SSD and stripes it together into a 66GB cache. Like other caching products, the size of the 1TB drive remained unchanged, and the extra space on the SSDs not being used for caching—about 217GB or so—is also still available as individual volumes. Since each SSD has its own lane to send and receive data, the configuration is theoretically able to saturate the PCIe interface with up to 1,500MB/s transfer speeds, and we got very close to that in testing with all four drives connected.

First, we connected just the hard drive by itself, and then the Vertex 4 SSD by itself, and ran our tests to show you what each drive is capable of by its lonesome (see benchmark chart). We then ran the HDD with each SSD added, one at a time, and ran our tests several times in order to see if performance would improve as the card began to cache the data used in the tests. Sure enough, it did, and each successive test run showed us increasing speed until we hit a ceiling. It didn't take long for the 1TB hard drive to become as fast as an SSD, and in many cases performance surpassed that of the lone Vertex 4 SSD, which is not surprising. As an example, when we ran HD Tune on the one-SSD-plus-1TB combo, we initially saw the drive hit 107MB/s sequential read speeds (the same score it hit on its own), then 169MB/s on the next run, then 194MB/s, and on it went all the way up to 242MB/s. PCMark would also show us a "drive-only" score first, around 5,000, then suddenly jump to 40,000 or so—a huge increase in speed.

The RocketCache works as advertised, in other words. The only problem is, who would use this device? We don't see it being used with three SSDs, due to expense (small, fast SSDs aren't that cheap), though if you can swing it you'll be a happy camper. The more interesting aspects are the RAID 1 options, which grant you huge-drive security with the safety of RAID and the speed advantage of drive caching. That is a truly unique combination of performance and security, and makes the RocketCache an interesting product that would kicks ass if we could boot from it. –JOSH NOREM

BENCHMARKS

	WD 1TB Black	OCZ Vertex 4	1 SSD and 1TB HDD	2 SSD and 1TB HDD	3 SSD and 1TB HDD
CrystalDiskMark					
Avg. Sustained Read (MB/s)	139.2	464	368	630.3	**969.6**
Avg. Sustained Write (MB/s)	138.0	500.6	423	**830.1**	737
AS SSD					
4KB Read (IOPS)	166	**6,876**	1,900	1,902	2,037
4KB Write (IOPS)	234	16,452	12,974	13,344	**14,454**
ATTO					
64KB File Read (MB/s)	139.7	383	349	638	**791**
64KB File Write (MB/s)	139.4	497	447	805	**895**
HD Tune					
Average read (MB/s)	107.3	298.2	242	**307**	297.4
PCMark Vantage x64	5,933	43,748	37,674	44,438	**46,032**

Best scores are bolded. All drives tested on our hard drive test bench: a stock-clocked Intel Core i5-2500K CPU on an Intel DZ77GA-70K motherboard with 4GB DDR3, running Windows 7 Professional 64-bit. All tests performed using native Intel 6Gb/s SATA chipset with IRST version 10.1 drivers.

VERDICT 9

HighPoint RocketCache 3240x8

+ LOTS OF CASH SSD speed for any rotating hard drive; multiple configuration options; impressive speed.

– LOTS OF RASH Semi-expensive; not bootable.

$160, www.highpoint-tech.com

HP Envy TouchSmart 4

The most enviable part is the price

THIS WE KNOW: Windows 8 is more usable with a touchscreen, plain and simple. Whether that's a practical scenario for tower-and-monitor setups is arguable, but it turns out that using touch on a laptop comes pretty naturally—even more so than we expected. So it's good news for consumers that touchscreen laptops are now legion, and that they run the gamut in features and price.

Representing the midrange is HP's Envy TouchSmart Ultrabook 4. What you see is what you get with this 14-inch clamshell—it doesn't assume the persona of a tablet with the twist of a hinge, like some of its higher-profile touch brethren. That keeps the price in check—the Envy TS 4 starts at $800—but there's more to a laptop than a modest price.

Since the touchscreen is such a key feature of the Envy 4, let's start there. It's 14 inches on the diagonal, has a native resolution of 1366x768, and consists of a TN panel with a glossy finish. If that sounds thoroughly ho-hum, you've got the picture. It looks pretty down-market—not very crisp, not very bright, with an annoyingly narrow vertical viewing angle. It's redeemed to some extent by the highly responsive capacitive-touch overlay, which registered our every tap, swipe, and poke at the screen accurately. Be warned, however: All that touching on the glossy surface makes for some spectacular fingerprintage.

Thank goodness for the touchscreen, though, because the touchpad had some issues—the usual sort of inconsistent performance found in many clickpads. Sometimes Win8 gestures registered, sometimes they didn't; at other times, programs seemed to launch just because the pointer drew near—that kind of thing. You can do some tweaking of the pad in the control panel, but we found ourselves just using the touchscreen for many chores.

The chiclet keyboard is nicely sized and spaced, and the keys have a slightly rubberized surface. All-in-all, typing on the Envy 4 was fairly comfortable and error-free. Our model featured the optional keyboard backlighting, which can be switched on and off with a top-row key, but not otherwise adjusted.

Our model also featured another upgrade option: the 1.7GHz Core i5-377U (versus a Core-i3). This makes its configuration very similar to the Lenovo Yoga Ultrabook we reviewed last month. As with that device, the Envy 4 fell behind our 1.8GHz zero-point in every benchmark test—not surprising, given the ZP's slightly higher base and Turbo clocks. More interestingly, the Envy 4 performed about 10–15 percent faster than the Yoga in our computing tests. That's likely the result of better or more aggressive thermal management. While the Yoga's CPU had a tendency to throttle down at regular intervals of testing, the Envy 4 held its high clock speed consistently. Of course, the Yoga is also a bit smaller at 13 inches, and a bit thinner (not to mention more than a pound lighter), so it makes sense the thermals would be adjusted accordingly.

Despite the Envy 4's slight speed advantage and its lower price, we'd be inclined to plunk down the additional $100 for the Yoga. That laptop has a far superior screen, a better keyboard and touchpad, a sturdier build quality, and the ability to fold into a tablet for times when that makes sense. And did we mention that it weighs more than a pound less? But, if you really need to count your shekels, the Envy 4 is a serviceable touchscreen option at an affordable price. –KATHERINE STEVENSON

VERDICT 7

HP Envy TouchSmart 4

+ ADMIRATION Good touch-screen responsiveness; respectable parts; affordable price.

– JEALOUSLY Weak screen; touchy touchpad; almost heavy for this class.

$905, www.hp.com

BENCHMARKS

	ZERO POINT	
Premiere Pro CS3 (sec)	840	960 (-12.5%)
Photoshop CS3 (sec)	100	132.3 (-24.4%)
ProShow Producer (sec)	1,122	1,254 (-10.5%)
MainConcept (sec)	1,901	2,268 (-16.2%)
Quake III (fps)	358.2	258.9 (-27.7%)
Quake 4 (fps)	76.1	63.5 (-16.6%)
Battery Life (min)	250	230 (-8%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point ultraportable is an Intel reference Ultrabook with a 1.8GHz Intel Core i5-3427U, 4GB of DDR3/1600 RAM, integrated graphics, a 240GB SSD, and Windows 8 64-bit

SPECIFICATIONS

CPU	1.7GHz Core i5-3317U
RAM	4GB DDR3/1600 single-channel RAM
Display	14-inch 1366x768 TN LCD
Storage	500GB HDD + 32GB cache drive
Connectivity	HDMI, 2x USB 3.0, USB 2.0, multiformat card reader, 802.11n, Wi-Fi, Bluetooth, headphone, mic, webcam, Ethernet
Lap / Carry	4 lbs, 8.5 oz / 5 lbs, 3.9 oz



Optional keyboard backlighting spruces up the Envy 4's black and brushed-metal interior.

Creative Sound Blaster ZxR

The sound card is back—but does your PC need one anymore?

IF YOU THINK of your PC as a lifeboat full of components floating in the Atlantic Ocean after one of those ARM-based subs put two fish into the side of the PC's troop transport, you can better understand the plight of the sound card.

With limited supplies in the lifeboat and a thousand nautical miles to get to land, who do you think the CPU, GPU, mobo, RAM, case, and HDD picked to throw overboard? Yup. Sound card gets to join modem, NIC card, and MPEG-2 decoder in Davy Jones's PC, which by the way, has a hell of a mod to make it look like a locker.

Well, maybe, just maybe, the sound card still has a few tricks left in it. That's what Creative is promising with its new line of Z-series cards. The line comes in the Z, Zx, and ZxR trim. The $100 SB Z is rated at 116dB and comes with a beam-forming mic, the $150 Zx version adds a nifty Audio Control Module that features both a 1/8-inch and 1/4-inch mic and headphone ports, as well as a large volume knob and microphone array. The top dog is the ZxR. For a hefty $250 you get the ACM plus a daughter card with higher-end, pro-grade analog digital converters as well as optical and RCA S/PDIF inputs and outputs. The ZxR card also uniquely features swappable Op-Amps, heavy-duty ground planes, and Burr-Brown digital analog converters rated at 127dB. Once the sound gets out of the card, Creative rates it at 124dB, though. All three cards support 600-ohm amps to drive really big cans, too.

The processor is Creative's Core 3D chip, which the company says is a quad-core DSP with 1,200 MIPs. That sounds like a lot, but the 20K1 chip in the Creative X-Fi boasted 10,000 MIPs. But such is the way of the PC. With quad-core processors standard and six- or eight-core CPUs



The ZxR caters to audio enthusiasts who want high-fidelity input options.

goldbricking, there's not much need for excessive amounts of processing power on a sound card. The old paradigm of benchmarking for frame-rate comparisons in a sound card is, frankly, outdated.

What matters most is how it sounds. Sound card reviews have long taught us that memory for audio isn't as good as our memory of how things look, so immediate A/B testing is the only way to ever test audio. Rather than put the ZxR against another sound card, we put it against its likely competitor: integrated audio, using the high-end Asus P8Z77-V Premium board with Realtek ALC898 codecs. We tested using 24-bit/96KHz audio files as well as Blu-ray encoded audio. Finally we tested the card in several games, including Hitman: Absolution and Call of Duty: Black Ops II multiplayer.

One thing struck us immediately: The ZxR tries too hard. On default, the card seems tuned for, well, younger tastes—kids who like music turned up really loud with a boatload of bass. On more delicate music selections, the card is too heavy-handed. With the sound tweaked for our tastes, however, the audio was clearly cleaner than integrated with less of the metallic rasp that cheaper motherboard audio can have. We also preferred the ZxR for movies—but also after being tweaked to turn down the bass, which tends to make everything a bit muddy. In gaming, the ZxR had the clear edge in Hitman: Absolution—switching from the onboard to the ZxR was almost as pronounced as going from mono to stereo.

We were particularly anxious to give the card's Scout Mode a spin. Scout Mode specifically amplifies footsteps to give you an "edge," theoretically, in gaming (no, it's not really cheating). Unfortunately, it didn't help us at all in CoD: BLOPS2, but we also admit it could be the underlying audio engine in the game that was unimpressive to us. We'll have to go through a larger library before we can pass a final verdict on Scout Mode.

So, where does the ZxR stand? If we had an existing add-in card, such as the still-excellent X-Fi or Asus Xonar, we would not upgrade. But if your motherboard has the worst sound implemented in history (and a lot of them do), it's time to go discrete, and the Z or Zx are good choices. The ZxR is best suited only for those looking for high-end audio-input needs.

As is, we think the sound card still has some life in it. It's not a given that it'll continue, but slotting in a sound card is a value-add no matter what your friends or your PC budget tells you.

–GORDON MAH UNG



VERDICT 8

Creative Sound Blaster ZxR

➕ **SOUND CARD** Far better gaming audio than onboard.

➖ **ONBOARD AUDIO** Default audio settings are far too heavy handed.

$250, www.soundblaster.com



Hello, sexy. We're talking about its capacity, not its looks.

If this roundup were a beauty contest, the DashDrive would easily win.





The Toshiba drive wins the contest of lamest names for devices and software, but is still the best drive here.

USB Hard Drive Hangout

One is huge, one is thin, and maybe one is just right for you

There are times when a USB key can't handle the action we're throwing at it and we need something bigger to step in and get the job done. Like a police officer calling for backup, it's at these times that we summon a USB 3.0 hard drive. This latest batch of drives offers something for everyone, from WD's huge 2TB jobbie to Adata's super-thin, sexy little thang. Toshiba's 1.5TB drive is thrown into the mix, too, for folks looking for a basic, affordable, high-capacity solution. –JOSH NOREM

WD MY PASSPORT 2TB

At 2TB, WD's My Passport is the largest-capacity USB hard drive we've ever tested, and its four chunky 500GB platters rotate at 5,400rpm. In the palm it feels about as thick as a huge English muffin with a piece of ham in the middle, or a water-logged deck of cards; it's the thickest drive in this roundup, but only by a tiny margin over the 1.5TB Toshiba. Though this drive is pudgier than the rest at 0.8-inch thick, it's noticeably shorter than the other two drives at just 4.2 inches long. It comes in a variety of pleasingly subtle, matte color finishes (red, blue, black, gray, white) and is available in sizes ranging from 500GB to 2TB.

The software package included with the My Passport is well-rounded, and includes backup software, an encryption utility, and a diagnostic tool. It should be noted that software for both Mac and PC are included, though obviously we're only testing the PC version. The backup software is called WD Smartware and is based on Memeo Backup—it backs up everything instantly without any user intervention, so you just tell it to keep an eye on "Documents," for example, and it automatically copies any files it sees that are documents. We learned the hard way, though, that "Documents" means .doc files, and not just any files placed into the Documents folder, which was confusing. Adding to the confusion was a lack of information about whether a backup had taken place once new files had been added to a monitored directory. You also can't create a backup image of your entire drive, which is another flaw. We rarely use bundled software, so this isn't that big of a deal for us, but it's a strike against WD nevertheless. The software does include a file-retrieval service in case you lose data, and it works well, letting you put files back into their original location or just dump them into a predetermined folder. Other bundled software includes a password-protection utility that requires a password to access the drive, and a drive-health monitor, which is useful.

To test the drive's mettle we copied 30GB of media files to it from our desktop PC running a Samsung 830 SSD boot drive, and it took top honors by taking just eight minutes, 46 seconds to complete the job. This was the fastest speed in our roundup of these drives, even though all the drives have roughly the same specs, so kudos to WD for the victory. Its time was almost three minutes faster than the Adata drive and two minutes faster than the Toshiba, so the performance differ-



ence is significant.

Overall, there's a lot to like about the WD drive, but we're dinging it pretty hard for having flaky backup software. The password-protection function is nice, but our favorite two things about it are that it's the biggest USB drive available, and of these three, it's also the fastest.

VERDICT 8

WD My Passport 2TB

$150 (street), www.wd.com

TOSHIBA CANVIO PLUS 3.0 1.5TB

In this group, the Toshiba Canvio initially came across as the vanilla stepchild—nothing to get excited about, at least in this company, given its bland exterior and specs. We tested the 1.5TB version of the drive, which is the highest capacity offered by Toshiba. Surprisingly, it's almost as thick as the 2TB WD drive despite its 500GB capacity deficit, so the lesson here is that if you're going big on a USB drive, prepare to be toting around a Hot Pocket-size enclosure. The 1.5TB drive is only available in black, a decision we are just fine with since we don't need nor want fancy colors on our USB storage. If you favor a splash of color attached to your USB port, you'll have to get by with less capacity, as only the 500GB and 1TB models are available in red, blue, and gray (as well as black, natch).

On the software front, the Canvio comes with a well-rounded package that includes backup software with encryption, drive utilities, a cloud storage option, and a movie-editing app called Muvee Reveal. The NTI Backup Now EZ backup software is for Windows only, though the drive includes an NTFS driver that lets you use it with both Macs and PCs. Despite the software's odd name, it's actually our favorite of this roundup, simply because it offers an intuitive interface and many options for configuring backups, whether you want to back up to the Canvio drive itself or to the cloud. You can also choose to back up categories of files, individually selected files and folders, or entire drive images. You just select the files you want to back up and let it run. You can also schedule backups, and see the status of the drive onscreen in the software, which is handy. It's also easy to password-protect the drive. The only problem we had in our tests was that the cloud option didn't work for us—you get a 30-day free trial of cloud storage with the drive but we couldn't activate ours. Note: The Basic model of this drive does not offer cloud storage as an option.

In our file-copy test, whereby we hustle 30GB of data over its fat USB 3.0 pipe, the Toshiba took second place overall with a time of 10 minutes, 34 seconds, which was almost two minutes slower than the WD drive, but faster than the Adata unit.

All in all, this is an excellent all-around backup drive. It's not the highest-capacity or the thinnest drive ever, but it has great software, decent capacity, and is affordable—we don't ask for much more in a USB storage device.

VERDICT 9

Toshiba Canvio Plus 3.0 1.5TB

$110, www.toshiba.com

ADATA DASHDRIVE ELITE 500GB HE720

The Adata drive is one of the sexiest USB drives we have ever tested, and is certainly the *thinnest* USB drive too, at just 8.9mm thick. It might not sound like much in today's world of super-thin everything, but this puppy is *thin.* In fact, our research indicates it is *the* thinnest USB drive currently available.

Since life isn't fair, there's a major downside to the drive's flatness, which is that its single-platter capacity is limited to 500GB. When compared to its 1.5TB and 2TB rivals here, 500GB is but a morsel, really, but that's the price you pay for its slim form factor. To that point, 500GB is the only capacity available for this model.

Despite its HE720 model name, which to our eyes suggests a 7,200rpm hard drive, this puppy sports a 5,400rpm drive inside its stainless steel chassis. Its physical size is 4.6 inches long and 3.1 inches wide, and it's less than a half-inch tall. Its exterior shell is made with 9H stainless steel, which is resistant to scratches and looks slick but is too prone to fingerprints. The drive itself has only two mildly interesting features: a small, blue LED for activity and a tiny button located next to the USB 3.0 plug labeled "Backup." Tapping the button triggers the included syncing software to open so you can configure and run backup routines. It would be handy if the backup button were in a more easily accessible location, as putting it right next to the USB plug makes it hard to reach.

The included Adata Sync software is PC-only and gets the job done for syncing, restoring, and backing up files, but it's easily the most unpolished software in this roundup. As an example, if you try to open the software when it's running in the background, you'll see a pop-up error that contains what we can only assume is either a foreign language or gibberish. The Window also looks like it was built for Windows 98 and lacks the ease-of-use and look-and-feel of modern software, as it just gives you a split-window with "Source" on the left and "Destination" on the right, and you have to check boxes in a Windows Explorer interface to get it configured. This is not software we'd want our parents to use, that's for sure. That said, we actually appreciate its unvarnished nature. You just tell it which folders you're interested in and choose Backup, Restore, or Sync. You can then either manually back up everything you want or just schedule the software to run. It's not glamorous or grandma-friendly, but we dig it.

During testing, the drive was the slowest here by a small margin, taking 11 minutes and 31 seconds to move 30 gigs of data onto its lone platter. We know people don't buy these drives for speed, and they are all relatively slow compared to our desktop HDDs and SSDs, but we do take speed into consideration.

The DashDrive is a decent package despite its flaws. We like its simple software, hard steel shell, and thin size a lot, making it a solid drive, both literally and figuratively.

VERDICT 7

Adata DashDrive Elite 500GB HE720

$80, www.adata-group.com



Google's top tablet sends a haymaker at the iPad but doesn't connect.

Google Nexus 10

Call it retina-searing

IF YOU DIDN'T believe there was a head-to-head hardware battle between Google and Apple brewing when the Nexus 7 came out, you need no more proof than the Nexus 10, which clearly demonstrates that the search giant is taking the fight to Apple for tablet supremacy.

It's not going to be an easy fight for Google; the full-size iPad has always been in a league of its own and has a serious head start, but Google isn't entering the fray unprepared. Built by Apple's BFF Samsung, the Nexus 10 is far better priced at $100 less than the iPad equivalent.

Don't think that just because it's relatively inexpensive it's not a premium, powerhouse device, though. With a retina-searing 10-inch 2560x1600 Super PLS display protected under Gorilla Glass 2, the Nex10 holds the pixel-density record for a tablet with 300ppi. "Retina" iPads, for their part, come in at 264ppi. It's not all about ppi though, as we actually think the iPad's picture has slightly more contrast, and feel its panel colors are more vibrant compared to the Nex10's.

In processing power, the Nex10 packs a dual-core ARM A15–based Samsung Exynos 5 at 1.7GHz and 2GB of RAM. It's plenty fast and generally smooth as glass to use. The tab comes out of the box with Android 4.2 and as a Nexus device, should be in the front of the line whenever a new OS comes out.

The unit has a 5-megapixel camera, along with a secondary 1.9-megapixel front-facing snapper. As ever, we're really not sure how useful having a camera on a tablet is except to make you look silly taking photos. Other specs include a Micro HDMI port, a Micro USB port for charging, as well as NFC support, and Bluetooth 3.0 rather than the low-power Bluetooth 4.0.

In the ever-important app category, Android fares well, but doesn't do so well is in games. Don't get us wrong, there's a huge selection available, but it's dwarfed by what's available for Apple devices. Thanks to the huge number of different Android devices with varying specs, many game developers are reluctant to develop for the platform.

Unfortunately, it's a situation that's not likely to change for the foreseeable future, so if you plan on playing a lot of games on your tablet, an iPad should probably be your number-one choice.

The Nex10 feels quite weighty—particularly if your last tablet experience was the Nexus 7—but at 21 ounces it's pretty average for a tablet of these dimensions and lighter than the new iPad. Either way, you won't be holding it in one hand for long. The nonremovable battery is 9,000mAh, promising nine hours of video, seven hours of web browsing, or 90 hours of music. During one hardcore video session though, with the screen brightness maxed out, we could get the battery to drain at 1 percent a minute. In general use, however, you should see at least a day of power with mixed browsing, reading, listening to music, taking a few stills and videos with the device, and getting Facebook updates pushed out to it. We'd rank it as average. For strictly spec-minded folk, the fourth-gen iPad has an even bigger 11,666mAh battery.

The unit is sturdy and well-made but doesn't have that premium feel. And let's not beat around the bush—the Nex10 is downright homely. It's shown up by the Asus-made Nexus 7 and blown away by the iPad in sex appeal. It doesn't look cheap, but it doesn't look great, either.

The biggest problem, though, is its lack of storage. There's no microSD card slot and the biggest version you can buy is only 32GB, which gets eaten up fast in a tablet. In Google's defense, none of the Nexus tablets have microSD slots, but at least they offer 64GB versions, folks.

The Google Nexus 10 is clearly a brilliant tablet and one of the best Android tablets out today, with a great price. The Asus Transformer Pad Infinity arguably beats it, but it also costs a lot more. With its generally stunning screen and near faultless performance, the Nexus 10 really does start to look like an iPad-beater. But let's break it down: The iPad no longer boasts the highest resolution screen around and is left looking over-priced, while iOS 6 is starting to seem a bit old-hat compared to Android 4.2. But the iPad still tops the Nex10's display for color depth, has a premium build, and boasts better options for storage and connectivity. So as good as the Nexus 10 is, if we had to pick in the here and now, we'd still give the iPad the edge, by a hair. –JAMES ROGERSON

SPECIFICATIONS

CPU	Dual-core 1.7GHz Samsung Exynos 5
GPU	Quad-core Mali-T604
RAM	2GB LP-DDR3
Screen Size / Resolution / ppi	10 inches / 2560 x 1600 / 300ppi
Dimensions / Weight	10.4 x 7 x .35 / 21 ounces

VERDICT 9

Google Nexus 10

+ ROY ROGERS Highest-ppi screen; fast; fair-priced.

− ROY BATTY Battery is a tad small; looks, well, not pretty.

$400 (16GB version), www.google.com



The VG278HE offers amazing image quality for a TN panel, but you'll have to purchase the 3D glasses and IR emitter separately.

Asus VG278HE

3D panel ups the ante with speedy refresh rates

THE ROBOTS will rise to cast us all into bondage before 3D becomes standard in every home. But while consumers and content-creators remain nonplussed by the third dimension, hardware manufacturers aren't giving up on their next big thing, inherent logistical problems be damned. Enter the Asus VG278HE, an almost identical monitor to its sibling the VG278H, minus the built-in IR emitter and bundled 3D glasses, but bolstered by a rapid 144Hz refresh rate.

What's the advantage? For one, it means it's capable of absolutely minimal tracing. Watch a high-tempo film trailer full of jump edits on a cheap screen and you'll see ghostly lines left behind. But not here, Michael Bay fans. It also makes for a level of clarity and depth in 3D that genuinely impresses/doesn't give you suicide-inducing headaches.

But putting aside this panel's 3D capabilities (it's not equipped with any of the gear you'll need to make use of it out of the box), it's the general image quality of the LED-backlit screen that really impresses. Black and white levels not only look great at the very ends of the spectrum, there's also clear definition between similar shades and no visible dithering of color gradients—both attributes we rarely encounter in a TN screen. White levels were very slightly oversaturated on our test monitor's default settings, but that was remedied with a little tinkering.

On the downside, its viewing angle is no better than the VG278H's, which means that, like its bro, it suffers some color distortion at the edges of the screen. Finding the optimal viewing angle can be a dark art, particularly if you've got natural light hitting the screen. The stand allows a good range of vertical adjustment though, and you're covered for inputs—HDMI, DVI, and VGA are all present and correct.

The screen's visual performance is really strong and goes a long way to persuading you it's worth the substantial outlay. But the physical build trails behind the likes of, say, a Dell monitor. We wouldn't be surprised to see a few working Dell screens in the wilds of Fallout 3's otherwise-barren wasteland, but something about the plasticky feel and wobbly movements of Asus's VG screens lead us to imagine a weighty knock from a cat doing some damage. It should be noted, however, that this monitor survived our testing process unscathed, and we have a knack for stressing gear.

In 2D or 3D, the VG278HE delivers a great display. It's actually slightly more cost effective to opt for its sibling, the VG278H, which goes for $600 but features an integrated emitter and includes cordless glasses. You will, however, give up the 144Hz refresh, which we think is worth the extra dough. You're only going to find its slight flaws annoying if you're using the panel for a group of people (sucks to be the ones farthest to the left and right) or if you're a Photoshop type. In that case, get an IPS panel instead. However, TN screens don't offer better image quality, more precise color, or clarity of movement than this. –PHIL IWANIUK

VERDICT 9

Asus VG278HE

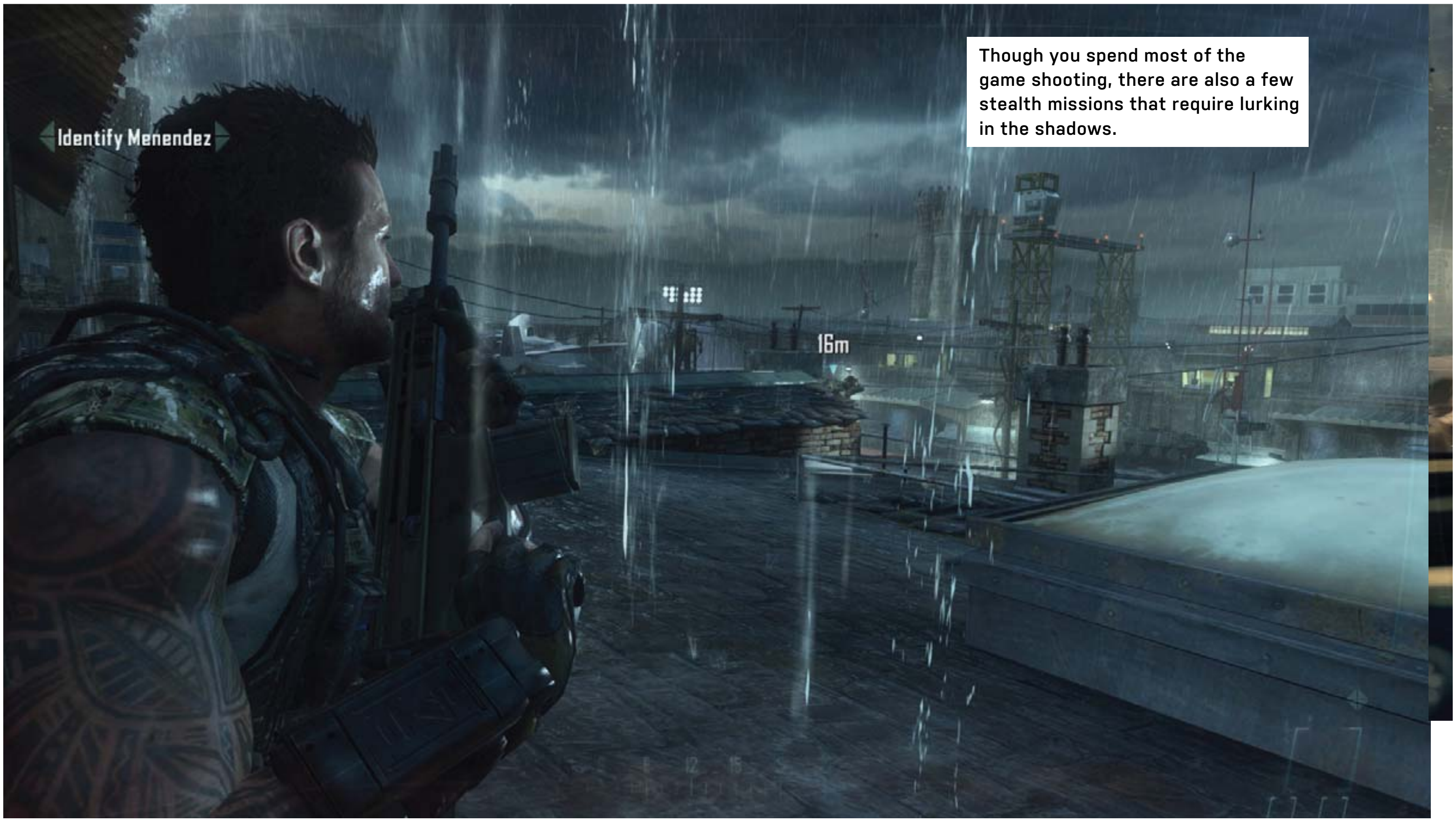
+ LIFE OF PI Higher refresh rate reduces eye strain; good performance for a TN panel.

– PIRANHA 3DD Expensive and plasticky.

$500, www.asus.com

SPECIFICATIONS

Native Resolution	1,920 x 1,080
Panel Size	27-inch
Panel Type	TN
Brightness	300 cd/m2
Response	2ms



Though you spend most of the game shooting, there are also a few stealth missions that require lurking in the shadows.

Call of Duty: Black Ops 2

Stop your eye-rolling, it's better than you expect

EVERYONE LOVES TO roll their eyes at the thought of a "new" Call of Duty game; after all, we've played games from this franchise a half-dozen times now, and the bloom is off the rose. But don't be so quick to judge, because the newest installment of Call of Duty is the freshest version of an old favorite that we've played since Infinity Ward's Call of Duty 4: Modern Warfare. In addition to a majorly revamped main campaign with several welcome surprises, it also sports a reasonably improved multiplayer mode and an all-new zombie mode that is a bit cliché at this point, but still a lot of fun.

As in previous titles, in CoDBlops2 you hang with your buddies from the last game, which include Woods and Mason, and are introduced to two new characters, Mason's son David, and David's sidekick Harper. The game still has you jumping back and forth between time periods to keep the gameplay fresh, so you'll find yourself on a mission in the '80s with Woods and Mason, and then you'll be off to 2025 with David and Harper. In the previous games, the missions always flashed backward in time, not forward, so even though the nano-based technology here is a bit Crysis-like, we dug the change of pace and new direction of the game. Another welcome change is that the game's missions let you choose different paths to take instead of just funneling you into a closed-off corridor, as in the previous titles. We liked being able to choose how we navigated a large battlefield without having to worry about getting killed or failing the mission if we strayed off the path. And though the game contains the now-par-for-the-course epic explosions, we didn't like the constant use of slow-motion here—at this point it's played out, especially in the CoD series.

Several optional RTS missions seem like cool new additions to the series at first, but turn out to be poorly executed. The missions have you controlling turrets and ground units in order to protect a base from an incoming enemy assault, but these missions are unplayable and annoying—in our playthrough, the squads we were commanding wouldn't go where we told them to go, rendering them ineffective. Luckily, the game developers must have known that people would either love or hate these missions, and they only force you to play through one of them; the rest are skippable.

The game has multiple endings—a first for a CoD title—that arise from the choices you make throughout the game, typically revolving around killing certain characters or sparing their lives. This is an interesting twist that gives it a little bit of replay value, and since the main campaign is rather short at about 6.5 hours, we went ahead and played the game twice to see another ending, and were generally satisfied with the twists



It wouldn't be a Call of Duty game without the requisite slow-motion explosions.



In multiplayer you can still customize your weapons with special optics, crazy colors, and more.

and turns the game took both times.

Black Ops 2 not only switches up the main campaign, it also offers a few fresh changes in its ever-popular multiplayer mode. You are now given 10 points to allocate to your soldier for enhancements, weapon attachments, and grenades. More multiplayer perks include quicker reload speed, faster running capability, and increased weapon damage, to name just a few. This let us create a loadout whereby we tossed our handgun in order to gain an extra attachment for our primary weapon, since we never use a pistol. The new perk system also lets you choose to just stack up perks for your soldier's skills, then go into matches with a knife and nothing else. We liked the heavy customization of our solider and his gear; it allowed us to tailor our loadout to our particular playing style, adding a lot more variety to the multiplayer mode than what we've seen in previous CoD games.

Finally, CoDBlops2 offers an all-new Zombie multiplayer mode which—you guessed it—entails killing waves of zombies in several custom maps that are available via three new gameplay modes: Tranzit, Grief, and Survival.

Tranzit was our favorite by far, just because it seemed like a fairly natural re-enactment of a zombie apocalypse scenario, which has you zipping around a variety of maps via buses to collect various items and parts from each location to help fight the undead. The best part is that the characters have personality, and will say funny things like, "You're lucky you saved me since I'm the one who does all the work around here," when you revive them in the midst of battle.

The Grief mode is aptly named: It's a four-versus-four squadmatch with zombies attacking everyone at the same time. Sure, that sounds like a cool idea, but getting into a match was nearly impossible since no one seemed to be playing it the first week the game was out. And of course, no zombie game would be complete without a "survival" mode, which has you and your squad fighting waves of zombies. This mode is simply cheap thrills, but thrills nonetheless.

The graphics look great and the game ran extremely well totally maxed out on our overclocked Core i7 Sandy Bridge system with a GeForce GTX 660 Ti at 1080p. Everything from the characters to the gun models to the explosions just looked badass. Adding to the eye candy is a whirlwind of exotic locations, including jungles in South America, deserts in the Middle East, and even the gritty streets of downtown Los Angeles.

In the end, we liked CoDBlops2 more than we thought we would. The single-player campaign is fun and the replay value is increased by the inclusion of multiple endings. And the overhauled multiplayer is surprisingly good.

If you've gotten tired of the Call of Duty games, we know the feeling. That's exactly why developer Treyarch tweaked the formula so much this time around, and the results are largely successful. Though it's not a perfect game, it's one that FPS fans certainly won't want to miss. –CHRIS ZELE

VERDICT 8

Call of Duty: Black Ops 2

+ WINDOWS 7 Campaign has multiple endings; great changes to multiplayer; zombie mode is good.

– WINDOWS 8 Slo-mo explosions are overdone; RTS missions are broken and annoying.

$60, www.callofduty.com/blackops2, ESRB:M

LAB NOTES

CHRIS ZELE **BLUE-SHIRTED INTERN**



Linux Gaming Gets Closer

Will Valve pass on Windows to get better pricing?

STEAM FOR LINUX has been out a short time, and Valve's gaming client has since launched more than 20 titles that are compatible with the open-source OS. That means the editors here have tasked me with building a Linux-based gaming machine to see how it compares to running Windows and Steam. I think it's a great development; to my mind, Microsoft really needs legit competition in the PC gaming arena.

Perhaps more interesting is the chatter that the now-confirmed Valve gaming box, Steambox, might actually run on Linux. As hard as it is to believe for some, it actually makes sense. Valve seems legitimately unhappy with Windows 8 and hints that Microsoft could make it a closed ecosystem. And if Valve wants to be competitive with the current and next generation of gaming consoles, it will probably need to hit a $300–$400 price point. I honestly don't see Valve hitting that if the company's Steambox is running on Windows.





Jimmy Thang
Online Managing Editor

I'm beginning to become really annoyed with Yelp. OK, so maybe not so much with the service itself, but the people who use it. A lot of my friends are treating it like it's an infallible food bible. My tastes often don't align with the Yelp consensus, but because my friends won't eat anywhere sporting fewer than three Yelp stars, I'm feeling limited. Think for yourselves, people!



Josh Norem
Senior Editor

This month, I tested the Radeon HD 7990 Devil 13 by PowerColor (page 70), and sure it's huge, loud, and fast, but more interesting is that the box it arrived in appeared like it was sealed with blood. As if that wasn't cool enough, it also included a full set of Wiha screwdrivers. The card didn't win a Kick Ass award, but its packaging certainly would.



Gordon Mah Ung
Deputy Editor

I don't know if my father-in-law has read my editorial from last month imploring him to upgrade his ancient plywood-modified laptop, but he seems intent on spending less money on a laptop than he did on a tablet, so far. Hopefully, he reads this part of the magazine, too. Or maybe it's better if he doesn't.



Katherine Stevenson
Editor-in-Chief

This month, Josh turned me on to a handy Chrome browser extension. It's called Honey and it's a stroke of genius. Compatible with more than 100 common online shopping sites, Honey combs (hey, that's funny) the web to dig up any coupon codes relevant to your purchase, verifies the codes, and then presents them to you before checkout. Cha-ching!

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Optical Drive Extinction
> HDD Platter Matters
> iolo System Mechanic

A World Without Optical Drives

I have been disturbed recently about the possibility of the optical drive going the way of the tech heavens. I first saw the news on The List in the magazine [December 2012], then there has been talk on the net about it, as well. I watch movies on my PC and have just started replacing all of my DVD collection with Blu-rays. Should I buy like four of these things now and stash them away in case of a sudden optical drive apocalypse? I can't imagine having a computer without an optical drive!

—Darren Haglof

EDITOR-IN-CHIEF KATHERINE STEVENSON RESPONDS: No need to do anything so rash as stockpile Blu-ray drives, Darren. We didn't mean to sound alarmist when we put the optical drive on our "Dead and Dying Tech" list. In fact, we expect to see optical drives around for a good while—at least for the foreseeable future. Our point was more about the stagnancy of the technology. When's the last time you got excited about a new optical drive spec? There's nothing new pushing the boundaries. If you got a high-performance drive a few years ago, you'll likely find that it's still the best you can get today. And then of course there's the fact that optical drives are no longer the necessity they once were. From software to movies to music, digital downloads provide an easy, clutter-free alternative. But again, we expect the hardware to continue to be available to folks who want it for years to come.

CUT, COPY, PASTE

In question #15 of our January 2012 Geek Quiz, we used the term "Unix distribution" when we should have said "Linux distribution."

Do Platters Matter?

I've read many a hard drive review in *Maximum PC* and they all seem to indicate that fewer platters is better. Can you please explain why this is so? Comparing a single 2TB drive to a pair of 1TB drives in a RAID setup, I expect to get better performance from the RAID. So with platters, can't the multiple platters be read in parallel, too, resulting in better performance?

—Andy Linder

SENIOR EDITOR JOSH NOREM RESPONDS: A drive with fewer platters will have higher performance when using rotating media, Andy. The reason is that fewer platters equals higher data density, so as the platters rotate, more data moves under the head than in a less-dense scenario, resulting in better performance. If you were to spread the data out onto more platters, it would require more rotations of the media to compensate. That said, on rotating media we're talking about very small differences in actual real-world performance, so we'd never advocate *not* buying a drive simply because it's a five-platter design instead of a four-platter design.

GPU Testing Resolution

As I read the glowing reviews of the GeForce GTX 660 cards in your December 2012 issue, I looked at the benchmarks, then I flipped to see a review of the GeForce GTX 670. Dirt 3: 75.7fps for the GTX 660, 70.02fps for GTX 670. Wow, the 660 is the "faster" card. After looking at a few more of the benchmarks and seeing similar results, something seemed amiss. Alas, looking at the very tiny print beneath the benchmark chart, I see you run your tests at 2560x1600 for the 670, and 1920x1200 resolution for the 660. I can understand different metrics for mobile/laptop graphics versus desktop, but how am I supposed to know what each test was run under? Why not a similar resolution for all desktop cards across the board? Where is the dividing line between where you test one card at a higher resolution and others lower?

—Colby Feller

SENIOR EDITOR JOSH NOREM RESPONDS: The current gaming landscape is divided into two camps when it comes to display size, Colby. In one camp we have gamers with 23–24-inch displays running at 1920x1080 (or 1920x1200, like ourselves), and in the other camp we have fragaholics with 27–30-inch displays who run at 2560x1440

↘ submit your questions to: comments@maximumpc.com

> WE TEST DIFFERENT CARDS AT DIFFERENT RESOLUTIONS SINCE THEY ARE DESIGNED TO BE RUN AT DIFFERENT RESOLUTIONS

or 2560x1600. Both of these groups need an appropriately powered card to run maximum settings at these resolutions, so a GTX 660 will run extremely well on a 1080p display, but not so much on a 2560x1600 panel. On the other hand, if you were to go buy a GTX 670, you could use it on a 1080p LCD, but that's a waste of horsepower. So, in summary, we test different cards at different resolutions since they are designed to be run at different resolutions. Also, we always explain what settings were used under each benchmark chart to alleviate any confusion.

System Mechanic Saves the Day

I have been an avid reader since the days of *boot*. As has happened so many times over the years, your "Optimizers Put to the Test" feature (November 2012) was easily worth the price of the subscription. I had the occasion to compare two of your picks, Piriform CCleaner (which got your Kick Ass award) and iolo System Mechanic. My aging-but-still-quite-capable Sony Vaio laptop, with Windows XP Professional, developed instability after installing an Avast update, and would not boot (except in Safe Mode). Various attempts at fixing it did not help (System Restore would not even run) and so, via the brute force method, I restored the registry file from a year-old backup, which allowed the machine to boot, but it remained unstable and crashed easily. I ran CCleaner. The program found a few errors and fixed them, but there was no improvement in my laptop's stability. So, reluctantly, I bought System Mechanic and, upon running it, it discovered over 1,000 (!) registry errors (again, that's *after* running CCleaner), along with other problems, all of which took about a half-hour to fix. Since then, the machine has been rock-steady, and it even boots faster (which could be secondary to ditching Avast). In my opinion, CCleaner should have been rated about a 6, and the iolo System Mechanic deserves a Kick Ass/10 verdict. It's the best product of its kind I have encountered in my 30-plus years of computing. Thank you for the review and keep up your great work.

—George Kapalka

[NOW ONLINE]

TOP 25 NEWS STORIES OF 2012

No, 2012 didn't end as the Mayans predicted, but it was still a crazy year... especially for tech news. Make sure to check out MaximumPC.com's "Top 25 News Stories of 2012" article, where we look back and provide perspective on controversial events such as Steven Sinofsky's departure from Microsoft, Samsung's $1 billion loss to Apple, and more. bit.ly/TWxzh5



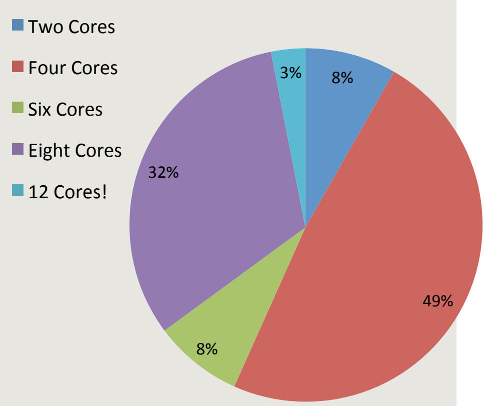
Facebook Polls

What Do You Think Is an Unsung Hero?

This month, we revealed our favorite "Unsung Heroes" (The List, page 14), but we wanted to hear from our Facebook fans, as well. We think the last one is the best.

Gary Kettlewood: The collection of spare parts—nothing worse than being one standoff short!
John Suit: Fan filters
Sergei Alekseyev: The ATX spec
Danial Garcia: Cables. We hide them but they play such an integral role
Michael Zions: Case fans
Gregg Thomas: A paperclip for retrieving discs from optical drives
Cory Notrica: The almighty Phillips-head screw
Janai Hall: Women in tech—we are just as serious about our PCs as the guys
Corie Burk: Internet Explorer. How else would we download Chrome or Firefox?
Paul Michael Glass: Can of compressed air
James Meyerhoffer: SATA cables; best thing to happen to airflow ever
Alex Lorenzen: Optical mice; no more dust bunnies
Cody Izzo: The USB port
Christopher Knapp: Hardware reviewers. They weed out the headaches so I don't have to

How Many CPU Cores Are You Running?



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THE BUILDS

BUDGET



INGREDIENTS

PART		URL
Case/PSU	Rosewill R519-BK w/500W PSU	www.rosewill.com
Mobo	Gigabyte GA-970A-UD3 ATX	www.gigabyte.us
CPU	AMD Phenom II X4 965 BE	www.amd.com
Cooler	Stock AMD cooler	www.amd.com
GPU	Asus Radeon HD 7770 1GB	www.asus.com
RAM	4GB (1x 4GB) Corsair Vengeance DDR3/1333	www.corsair.com
Optical Drive	Lite-On iHAS224-06 DVD/CD writer	www.lite-on.com
SSD	OCZ 128GB Vertex 3	www.ocztechnology.com
Hard Drive	1TB Seagate Barracuda	www.seagate.com
OS	Windows 7 Home Premium 64-bit	www.microsoft.com

Approximate Price: $692

THIS MONTH, our budget box faced a dilemma, as we found out our previous favorite chassis—the Rosewill R218—is no longer available. We debated using either another Rosewill chassis, as they tend to be the best inexpensive cases (in our opinion), or elevating the entire system by upgrading the case and PSU to the Corsair Carbide 200R and CX430 PSU. But that would bump the cost of our system up just enough to be painful for most budget buyers, so cooler heads prevailed and we went with a new Rosewill chassis—the R519-BK with 500W PSU. We also held steady with AMD this month despite considering the Intel Core i7-3220T, which would also have increased the system price. So, in the end, no big changes this month aside from the chassis.

BASELINE



INGREDIENTS

PART		URL
Case	Corsair Carbide 200R	www.corsair.com
PSU	Corsair HX650	www.corsair.com
Mobo	Asus P8Z77-V	www.asus.com
CPU	Intel Core i5-3570K	www.intel.com
Cooler	Cooler Master Hyper 212 Evo	www.coolermaster.com
GPU	EVGA GTX 660 Ti	www.evga.com
RAM	8GB Patriot Gamer DDR3/1600	www.patriotmemory.com
Optical Drive	Samsung SH-222BB	www.samsung.com
SSD	128GB Samsung 830 Series	www.samsung.com
Hard Drive	1TB Seagate Barracuda	www.seagate.com
OS	Windows 7 Home Premium 64-bit	www.microsoft.com

Approximate Price: $1,127

IT LOOKS like it's a month of chassis changes. On this build, we examined each component closely and ended up swapping the Fractal Design R4 for the Corsair Carbide 200R because it's just as excellent and costs half as much. The other major change is that we upgraded our GPU from a GeForce GTX 660 to the 660 Ti version just because it's only an extra $30, and that's not a bad price to pay for the its GK104 goodness. We didn't even consider replacing the Intel Core i5-3570 CPU because it is by far the best CPU in the bang-for-the-buck category. We are also holding steady with the screamin' Samsung 830 SSD and the 1TB Barracuda due to their killer price-to-performance ratios.



THIS MONTH, we had a heated discussion about replacing the Intel Core i7-3820 CPU with something a bit more baller since this build has some leeway in its budget. The problem is that the Core i7-3820 is on an island of price-and-performance, meaning it sits in between the newer (and very fast) Ivy Bridge chips in LGA1155 trim but lets you buy into a platform that'll take such elite chips as the, well, Core i7-3930K or Core i7-3970X. So we let it be this time around.

We also thought about swapping the GeForce GTX 670 for a GTX 680, but the 680s have not dropped in price very much, whereas our GTX 670 is just $340 now, making it a smokin' deal. We did swap out the Samsung 840 (non-Pro) SSD for a Corsair Neutron GTX 240GB, however, as the Samsung is untested by us at this time, and the Neutron GTX is $50 less expensive than the reigning SSD champs: the Samsung 840 Pro and the OCZ Vector. We'll be swapping the NZXT Havik for a water-cooler in the near future, as well.

For our complete Best of the Best list of recommended components, visit www.maximumpc.com/best-of-the-best.

INGREDIENTS

PART		URL
Case	NZXT Phantom 410	www.nzxt.com
PSU	Corsair HX750	www.corsair.com
Mobo	Asus Sabertooth X79	www.asus.com
CPU	Intel Core i7-3820	www.intel.com
Cooler	NZXT Havik 140	wwww.nzxt.com
GPU	MSI GeForce GTX 670	www.msi.com
RAM	16GB Corsair Vengeance DDR3/1600	www.corsair.com
Optical Drive	LG WH12LS39 BD-R burner	www.lg.com
SSD	240GB Corsair Neutron GTX	www.corsair.com
Hard Drive	3TB Seagate Barracuda	www.seagate.com
OS	Windows 7 Professional 64-bit	www.microsoft.com

Approximate Price: $1,865

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WATER-COOLING SYSTEM
Corsair H100
$120, www.corsair.com



SSD
Samsung 840 Pro
$270, www.samsung.com



3D DISPLAY
BenQ XL2420T
$400, www.benq.com



FULL-TOWER CASE
Cooler Master Cosmos II
$110, www.coolermaster.com



MUSIC SPEAKERS
Audioengine A5+
$400, www.audioengine.com

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